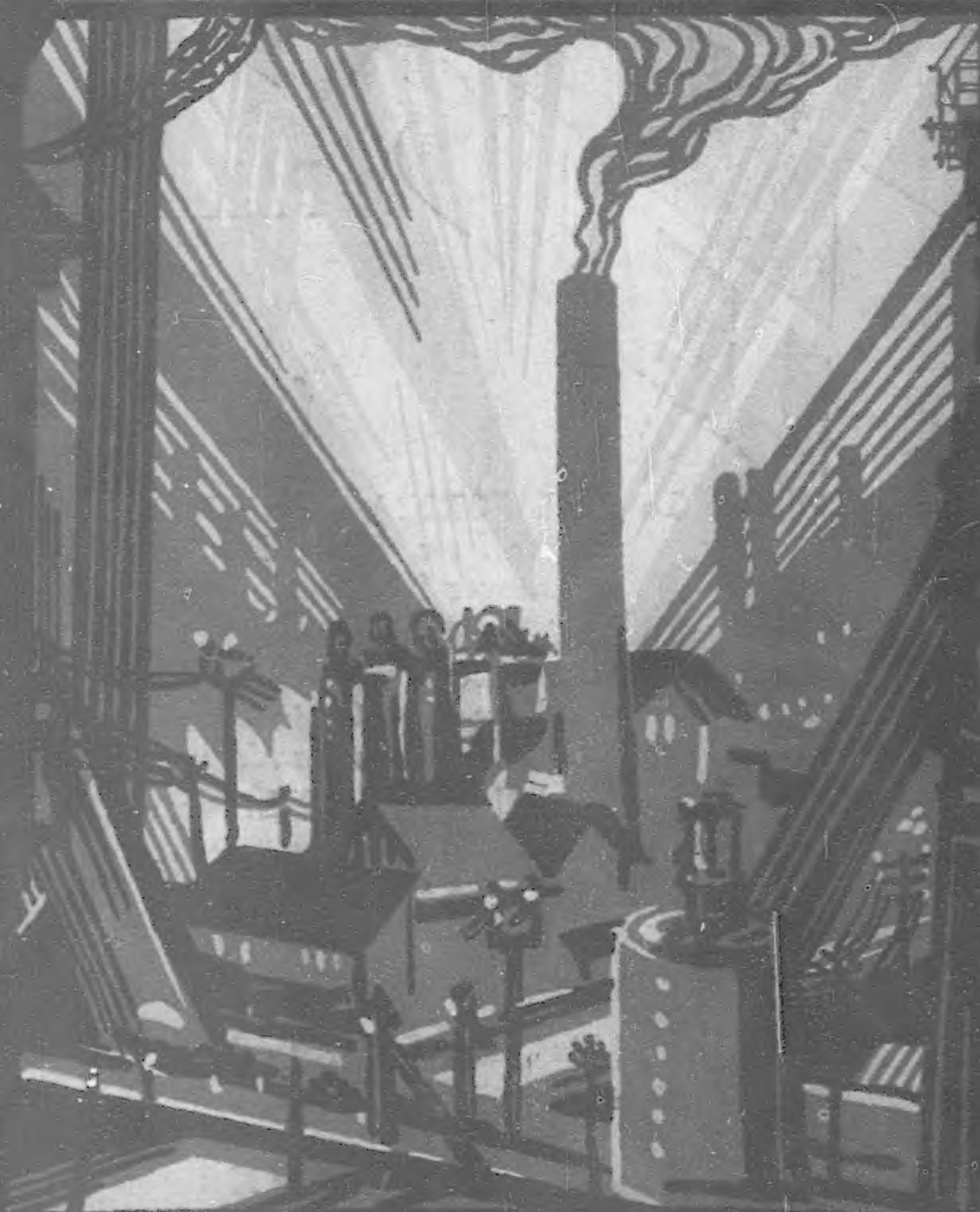


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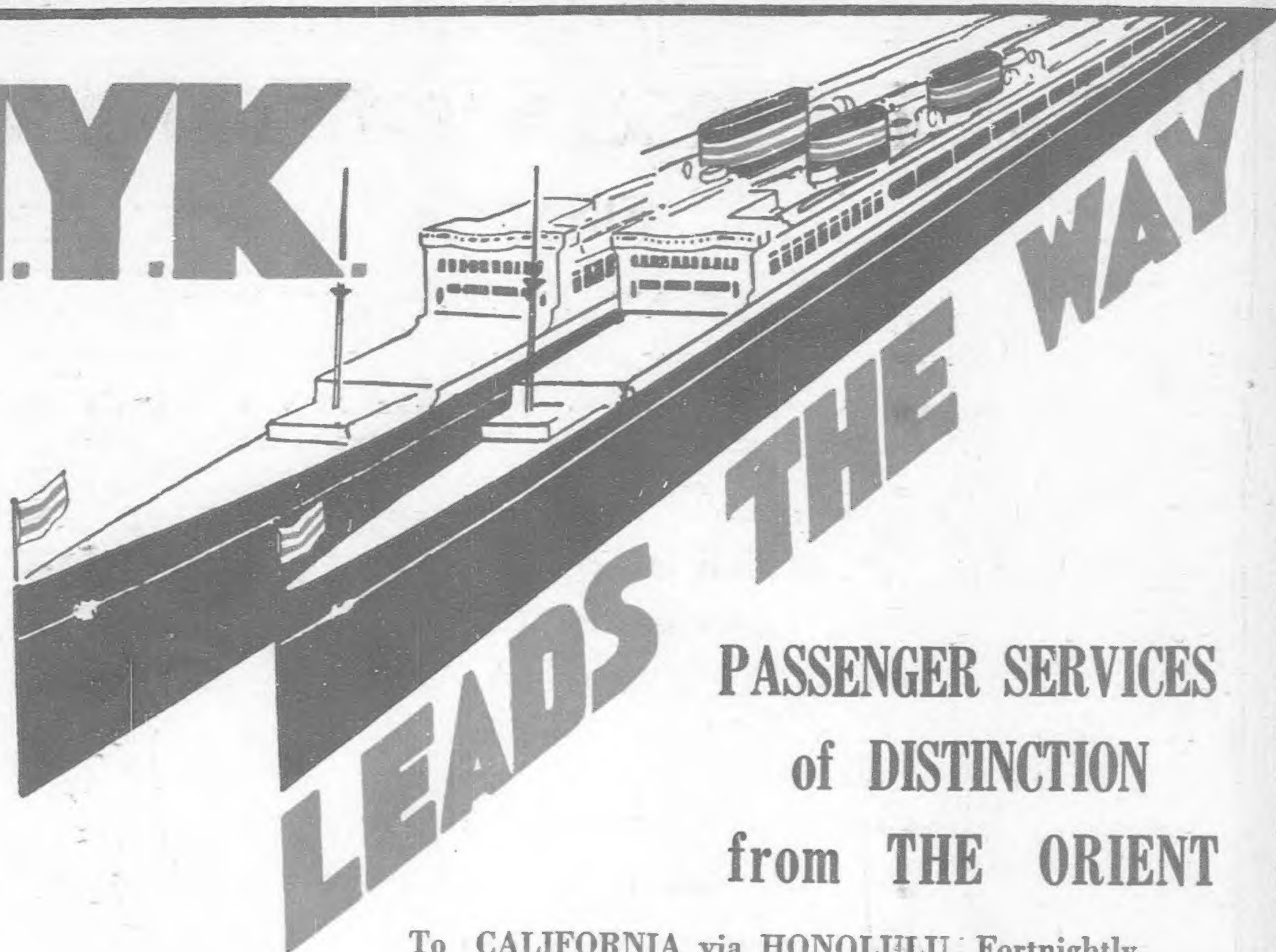
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A Long Way from Kuala Batu

Two kindly, inoffensive British missionary ladies have been beheaded by the Red-Bandits of Fukien, who brazenly announce; "we have power to take you foreigners; to hold you for ransom and to kill you! Miss Nettleton and Miss Harrison have gone to their reward, martyrs of a Faith that millions have gladly died for and millions more stand ready to die to uphold. *Who was responsible for this latest horror?*

We have all been culpable; the Nationalist Government for its pitiable failure to exercise the first rudiments of government and extend its authority into Fukien; for its senseless anti-foreign attitude, anti-Christian propaganda and Communist slogans inciting the ignorant masses against "foreign imperialists," and for its general inability to preserve law and order; the British Government for a policy of surrender and scuttle originating in Hankow which has since imperilled the whole structure of foreign rights before the Chinese are competent to guarantee protection or maintain law and order; the American Government for a wabbling policy that refused to co-operate with other Powers at a time when sanctions could have been imposed to compel Nanking to discharge its international obligations by concentrating its energies in maintaining law and order, disbanding its armies and making the country a safe place to live in before consenting to discuss the abolition of extrajurisdiction and other safeguards held indispensable for the protection of foreign lives and properties; lastly, the Missionary Boards, Church Societies, Philanthropic and Educational Bodies, who in their zeal to convert and uplift China and advance their own usefulness, exerted their powerful influence to have armed protection withdrawn. The Missionaries went to the extreme of voluntarily surrendering their extra-territorial privileges placing their trust implicitly in the friendliness of the people amongst whom they labored. Had the missionary element kept out of politics and refrained from exerting pressure upon Washington and London, the course of events in China these past three years would have taken a different turn. China owes her immunity to outside intervention to the efforts of the evangelical and educational element to conserve their own properties and usefulness, with no thought of the disastrous effect their program would have on the interests of the business community. The Missionary Boards must assume a large share of the responsibility for a situation which led up to the martyrdom of the two British ladies who were sent into the communist and bandit infested wilds of Fukien where no protection could be extended or rescue carried out.

For over three months the outside world knew of the impending tragedy in Fukien. Ample warning was given by the bandits. Their threat has been carried out. The horror has been perpetrated. The facts are known. Still not a word comes from London except the usual fiddle-faddle that the British Government has only been waiting for the details of the murder to "send in a strong protest to Nanking!" While these two defenseless British ladies were undergoing torture in Fukien, the British Minister was proceeding with negotiations in Nanking that resulted in the rendition of Weihaiwei, the British Concessions at Amoy and Kiu-kiang, and the remission of the Boxer Indemnity, bartering away the last remaining safeguards for the protection of his nationals in China! The British Government now sends in another protest to a government that to date is plainly incapable of exercising

its fundamental obligations to provide protection to anybody, not even to itself! Even the American Government contents itself with trivial protests when one of its citizens is kidnapped, murdered, outraged, held for ransom or otherwise maltreated. Its a long, long way from Kuala Batu to Changsha. If our readers don't understand what this means, ask some American naval officer.

Before the world, Nanking is officially responsible for the Fukien tragedy and must make amends. Nanking is the victim of its own short-sighted, intransigent and bombastic program. But Nanking is no more responsible than London or Washington, who with an exact knowledge of conditions in China, hastened to recognize the Kuomintang régime as representative of all factions, well knowing that its edict did not run outside of Kiangsu, Chekiang and a part of Anhwei, with even these three provinces overrun with bandit and pirate gangs. Washington and London are accurately informed as to conditions on the Yangtze. They know that practically every warship or merchant steamer that plies the Great River, must run the gauntlet of fire from bandit, communist or free-lance armies. Hardly a week passes when some American gunboat is not compelled in self-defense to answer the fire of these river batteries. Whether we like to admit it or not, the cold, hard fact remains, that China is as much at war with the United States as though an open declaration of hostilities had been declared. Our naval officers and their men are constantly exposed to sudden attack, with no adequate protection in their little tin-armored boats from the bullets and shell-fire of forts and roving Chinese bands. This state of war is not confined as it was formerly to the upper reaches of the Yangtze. The most dangerous districts are now between Wuhu and Hankow, in the heart of territory ostensibly under the control of Nanking. If the people of the United States desire the true facts of this situation let them demand the publication of the full reports of the commanders of the little fleet that comprise the Yangtze Patrol. It would make interesting reading. The wave of indignation that would sweep over the country would soon result in a change of policy towards the abolition of extrajurisdiction and squash the campaign for the withdrawal of these gunboats.

Nanking is not altogether to blame for this situation, nor can it rightfully be called to account for outrages against foreigners in Fukien or any other section of China overrun with lawless bands of desperadoes, which it has had no time or opportunity to suppress. For two years, Nanking has been battling for its very life against one combination of war-lords after another, against armies and roving bands of bandits and communists who have overrun and laid waste whole provinces. Every cent of its revenues, every available man and every ounce of its energy has gone into the fight to maintain the fiction and responsibility it assumed when the precipitate action of the Powers recognized it as the Central Government of China. Premature recognition was bad enough but when this was followed by serious negotiations and conversations looking towards the immediate abolition of extrajurisdiction and the surrender of the concessions with a government that could not guarantee its own existence from one day to the other, the height of sentimental diplomacy was reached and the lives and properties of all foreigners in China placed in jeopardy.

Responsibility does not touch a government of untrained, immature and inexperienced enthusiasts wafted suddenly into positions of authority on a wave of sentimentality, communistic and anti-foreign slogans, with the real power wielded by a group of hard-boiled militarists whose command of huge armies enable them to dictate internal policy and a division of the revenues. These facts have been patent to all observers for the last decade or more. The war-lords have divided the country between them and employed their bright, foreign-educated adherents as diplomats and propagandists to distract attention from the real state of affairs and proclaim a unity and common policy which has never existed. That clever men like Dr. C. T. Wang and his group in the Waichiaopu have been able to wrest one diplomatic victory after another from the Powers in the face of conditions prevailing in China, is a reflection upon the intelligence of those governments who have betrayed their nationals by even consenting to discuss any modification of their rights until the militarists were subordinated to the civil power and a government exists in China competent to preserve law and order and provide protection to its own nationals and foreigners alike.

At no time since the recognition of Nanking has the civil power been permitted to exercise its authority; at no time has the Nationalist Government been in a position to maintain law and order even in the restricted territory immediately under its jurisdiction; at no time has any assurance of the Foreign Office been worth the paper it was written on; yet with these facts in the possession of their governments, foreigners residing in China after repeated protests, have witnessed with growing alarm and consternation the progress of negotiations and conversations for the surrender of their sanctuaries to a government unable to maintain law and jus-

tice or provide protection for their security; a cruel betrayal that has no parallel in modern history.

Nanking is Nanking. It represents and speaks for China. Its first obligation is to defend and advance the interests of its own people. It demands abolition of extraterritoriality, the surrender of Shanghai and all other impairments of China's full sovereignty. All fairminded foreigners will welcome the day when its aspirations can be honorably attained and they can co-operate in harmony to promote its prosperity and welfare. Dr. C. T. Wang and his group are entitled to every consideration, tolerance and even admiration for the ability they have displayed in taking advantage of the present world situation to wrest concessions from the Powers.

Censure and criticism for any relaxation of vigilance, or surrender of extraterritorial rights until China can be safely trusted to discharge her international obligations, must be directed against those in high places, who with a perfect knowledge of conditions in this country, are still willing to throw away the safeguards and expose their nationals to the perils of uncontrolled mobs easily inflamed by any school-boy agitator or Red agent.

A grave responsibility rests upon Washington, London and Tokyo at this moment. Economic conditions in these three industrial countries and the urge to retain the friendship of China as an outlet for trade, may dull the sense of national honor, but there is a limit beyond which it is not safe to pass, and that limit was reached with the cruel, inhuman torture and beheading of these two Christian ladies and the boast of the bandits; "we have the power to take you foreigners; to hold you for ransom and to kill you." *Yes, it is a long way from the Barbary Coast and Kuala Batu.*—G.B.R.

THE AFTERMATH

October 23: As we go to press, comes the report that the Communist-Bandit armies have sacked Kianfu, in Southern Kiangsi Province and taken prisoners four foreign Catholic priests and six foreign Sisters of Charity. One German Catholic priest and two Chinese priests were slaughtered. Bishop Mangani and one companion were released by the bandit general in order to convey to the Missionary Boards and their respective Governments the demand for \$10,000,000 ransom!

First, the two defenseless British missionary ladies were mutilated and barbarously beheaded. Immediately after, an American priest in Honan was kidnapped and held for \$300,000 ransom. Now comes the wholesale outrage upon the French and Italian missionaries, the biggest haul of foreign captives since Lincheng. This makes 41 missionaries killed and 108 captured and held for ransom in the past four years, proof positive that there exists a sinister plot hatched in Moscow to overthrow the Nanking Government and unite all China under the banner of Communism to resist "foreign imperial intervention." In no other way can we explain these wide-spread outrages with their audacious demands for ransom that no self-respecting government can listen to without completely abdicating its authority and confessing its inability to perform its functions.

The Fukien horror exposed the utter incapacity of Nanking to protect the lives of foreigners in the interior. The Kian outrage, if it leads to nothing more than a demand for ransom, is the natural sequence of the policy of surrender which placidly contemplated for three months the torture of the two British missionary ladies and their impending execution as "imperialists." If the Kian outrage is carried to the same horrible lengths, the Powers concerned have nobody to blame but themselves.

If the Kian tragedy is permitted to run its logical course with the Powers sitting idly by waiting for

Nanking to impose its authority and we wake up some morning to learn that these four Catholic priests and six Sisters of Charity have been martyred, foreigners in all parts of China will be compelled to seek refuge in Shanghai as the only place left in the country where there still exists a modicum of protection such as the pitifully inadequate detachments of British, French, American and Japanese troops and their war-ships can extend.

For, if the same policy of *laissez-faire* is pursued in regard to Kianfu, it will be followed by another wholesale tragedy in which the entire foreign residents, men, women and children, of some treaty port will be rounded up and marched off to the lairs of the bandits to undergo torture, dishonor, unspeakable indignities and final execution as "imperialists." For three months the British Government, engrossed in its well intentioned negotiations calculated to demonstrate its friendship and strengthen the Nationalist Government by a full recognition of its sovereignty, took no effective measures to preserve its own honor in Fukien.

There is little hope that this general policy of surrender on the part of the Powers will undergo any change. The American Government will make another perfunctory protest against the capture of the Filipino Sister of Charity; the Italian Government will fulminate and do nothing while the French Government, "The Protector of the Faith in Infidel Lands" will ceremoniously invite attention to the provision in the French Treaty that "efficient protection shall be given to all missionaries, etc." The incident will blow over. Not until a wholesale massacre of foreigners that will overshadow the Nanking incident takes place, will the Powers unite in some common program to support and bolster up the Nationalist Government in its stupendous task of pacification, and supreme struggle against the communization of the country. By that time it may be too late.

SIMPSON

A Lesson and a Warning

ONE does not always agree with Mr. Bertram Lennox Simpson. There are times when his pointed pen cuts deeper than a sword. When wielded as it has been on innumerable occasions on behalf of China, it has won more victories for her than battalions or diplomacy. His articles in the *Peking Leader* and several London newspapers denouncing the Nationalist régime stand as the most scathing indictment of any Chinese Government ever penned by a foreign critic. When, on top of this powerful anti-Chiang propaganda, he threw in his lot with Marshal Yen and accepted a post which enabled the Northern Coalition to divert the Tientsin Customs revenues into their own war-chest, he dealt the Nationalist cause a blow heavier than any defeat it could have sustained on the field of battle, and in this respect materially assisted in prolonging the war and the miseries of the people.

Mr. Simpson went outside the scope of legitimate journalism to give force to his arguments and threatened those who did not agree with him with dire vengeance. Had Yen Shih-shan emerged from the war a victor, Mr. Simpson would undoubtedly have been elevated to the post of High Adviser to the Peking Government, in a position to make good his threat against those who supported Nanking. In his signed editorial in the *Peking Leader* of June 7, after denouncing Nanking for incapacity and alleged corruption, he concludes as follows —

"Thus the battle now raging is a *jehad*, a holy war to expel from the body politic an ugly growth. It is a sad reflection that at such a moment the representatives of some countries should see fit to identify themselves with a cause that is not theirs except in the sense that they have been accessories before the fact; and that it is devoutly to be hoped that before it is too late they will see the light.

"For as surely as the sun rises when the Capital is back in Peking before the end of the year, a reckoning will be called, and those who have made themselves henchmen of the camarilla will find that they must follow that camarilla into exile with a label attached to them which will follow them through life."

This indicates either an unbalanced mind or the height of vindictive partisanship, a deliberate threat against all foreigners who believed that Nanking was worthy of respect and support and voiced their endorsement of its program. Mr. Simpson's character was further revealed when in taking over the Tientsin Customs offices from Colonel Hayley-Bell and was informed by the latter that his instructions were to evacuate the whole staff in the event of interference, he retorted that any Chinese obeying the evacuation order would be shot.

Like several impetuous propagandists for the Nanking Government who have resorted to minatory language in order to intimidate Americans into an immediate surrender of their extraterritorial privileges, Mr. Simpson advocated stern measures against all who continued to support and work for the recognized government at Nanking. After the collapse of Yen Shih-shan's Government and the turning over of the Tientsin Customs to the Manchurian War Lord, Mr. Simpson was visited by three Chinese gun-men who obtained entrance into his home in Tientsin, shot him down in cold blood and made their escape. Mr. Simpson is hovering between life and death with slim hopes for his recovery. This dastardly attempt at assassination comes as a climax to the long drawn out campaign of vituperation and intimidation indulged in by foreign champions of Chinese factional leaders.

We deplore and condemn an outrage that can only lead to further excesses and retaliation upon foreigners who openly align themselves with any Chinese faction. As Mr. Woodhead points out in the *Peking and Tientsin Times*, "Foreigners who take so prominent a part as Mr. Simpson did in Chinese political conflicts take great risks in these desperate days."

There seems to be a general tendency to explain the outrage as having no political significance, but to our mind it will be difficult to sustain such an argument. The assassins may never be found or brought to justice. We may never know who employed them, but in the minds of all impartial observers, the crime will remain as typical of Chinese political methods.

According to Mr. T. V. Soong, the Nationalist Minister of Finance, "Mr. Simpson has committed crimes against the government and people of China deserving of the severest punishment by due process of law." While we sympathize with Mr. Soong's righteous indignation and resentment against a writer who has so maliciously lampooned and libelled him and his colleagues, we fail to see the difference in the position of Mr. Simpson and many other foreigners employed in various capacities by the provincial and factional governments of China. Foreign opinion in China is largely influenced by its environment. Foreigners residing in the North are intensely hostile to the cult of Dr. Sun Yat-sen and will never be reconciled to the removal of the center of government from Peking and the loss of their positions as official advisers, perquisites and profitable government contracts. The Young Marshal has a group of capable foreign advisers in his employ and although Nanking professes full confidence in his loyalty, yet there are many Manchurian revenues belonging to the central treasury that are diverted to his own use. Can Nanking fairly hold these Advisers responsible for Mukden's seizure of revenues that rightfully belong to the Ministry of Railways?

The Nationalists also employed foreign advisers, entrusting even the direction of their Northern campaign to Borodin and his group of Soviet lieutenants. Nanking to-day has on its payroll many foreigners, who have taken part in the recent hostilities. They have also in their employ several blatant advisers and propagandists, who in their own way are committing crimes against their own people, by indirectly inciting the Chinese to violence. To single out any one foreigner and accuse him of crimes against the government and people of China, is, under the circumstances, somewhat far-fetched.

In identifying himself with the rebels and accepting a position almost equivalent to that of Finance Minister, Mr. Simpson violated his neutrality as a British subject and surrendered the right to appeal to his government for protection. If killed, wounded or captured by the Nationalists during the campaign he had no redress, except the slight treaty protection afforded by his extraterritorial rights which he had forfeited. In this respect, Nanking has a good case against Mr. Simpson, or any other foreigner who violated his neutrality by taking an active part in the recent rebellion against the recognized authority and seeks to escape punishment by hiding behind extraterritorial privileges. Nanking was fully justified in requesting the British authorities to exercise their jurisdiction over Mr. Simpson and compel his observance of neutrality. It was not his fight. As a private citizen he was free to enlist in the rebel service and the British Government could not interfere. In any other country he would have no appeal from any sentence imposed upon him. Extraterritoriality was not intended to cover such cases and to invoke these rights to protect an individual against the punishment attached to the act of rebellion against the recognized government, strengthens China's demand for the immediate abolition of the system.

In accepting a high executive position under the Rebel government after hurling invective against Nanking and threatening the heads of the Nationalist Government and all foreign supporters with exile and disgrace, Mr. Simpson placed himself in a most embarrassing position. It is bad enough for a Chinese official to exhibit such vindictiveness; it is unpardonable on the part of a foreigner. Mr. Simpson has weakened the position of his fellow nationals and all foreigners who still enjoy extraterritorial privileges in China. He has made it impossible for the British Government to protest against the cowardly attempt on his life or to demand that the criminals be brought to justice. After Mr. Soong's denunciation of his "crimes against the Chinese people and government" it is hardly probable that any serious effort will be made to apprehend or punish the gun-men who shot him down in cold blood.

The attempted murder of Mr. Simpson emphasizes the risks and dangers to all foreigners at this time of great political stress and utter absence of law and order. It is a lesson and a warning to all foreigners who abuse their extraterritorial privileges by departing from an observance of strict neutrality.

Japan's Right to Exist

WHAT will Japan do with her surplus millions? Will a nation of 65,000,000 people* increasing at the rate of 900,000 a year, with the doors of practically every country in the world closed to their entrance, lay down and meekly practice race suicide in order that more favored groups can monopolize the waste spaces of the world as feeding grounds for their own posterity? For the present, Japan has determined to exhaust every honorable and pacific means to safeguard her right to exist in a world that is daily becoming more and more nationalistic, callous to the problems and needs of others and intolerant in any matters that affect the right to restrict immigration and impose tariffs. Other rich and powerful nations blessed with large extents of undeveloped territory, self-sufficient in food supply and natural resources, fail to realize the seriousness of Japan's situation or to give her credit for attempting to find a way out of a perplexing and explosive predicament without resorting to aggression on weaker states or appealing to arms to defend and assert her right to exist.

Birth control, contraception, abortion and other unnatural means of restricting propagation, bring their own inevitable penalties in diminishing fecundity, until the people who resort to these practices arrive at a point where their power to procreate is seriously impaired. One great western nation voluntarily curbed its birth rate to the point where its population remained stationary for decades while its next door neighbor became the most prolific nation in Europe. The nation that did not need new territory as outlets for its people, became in the course of time, the second colonial power in the world. It's prolific neighbor, that entered the race for colonies too late in the land-grabbing game and who urgently needed these outlets, was compelled to absorb its population increase at home, becoming in a few decades the most highly developed industrial country in Europe, a formidable competitor and menace to the powers who combined to prevent her acquisition of colonies. The result was the World War. There were other surface political causes that precipitated the conflict, but operating underneath, were the explosive forces of a compressed population seeking an escape from their artificial confinement. The victors at Versailles again parcelled out the waste spaces of the world amongst themselves, adding to their already top-heavy empires, with no thought of the fundamental forces working to provoke another catastrophe. France, with no need for territory as outlets for its stationary population, now holds her great African Empire as a reservoir of colored troops upon which to draw to defend her home land against the pressure of more prolific neighbors. For the time being, an enforced peace exists in Europe, but if the population of France continues to remain stationary while Germany resumes her pre-war birth-rate sooner or later, the Germans will again demand and fight for their "place in the sun." Italy's remarkable fecundity and lack of suitable colonies, has brought about conditions just as explosive as those which led up to the Great War. Mussolini is calling upon his people to give him Sons, to multiply and be prepared to assert their right to live and expand. Some day Italy will explode in the same way that Germany did and Europe will be plunged into another war. Peace Pacts, Arbitration Treaties, Disarmament Agreements and other panaceas for world peace are not likely to usher in the millenium as long as a few favored nations or races hold the waste spaces of the world closed to the entrance of other virile and prolific peoples.

In the same way that the Powers combined to bottle up the Germans and oppose their acquisition of colonial outlets, they have come together in a tacit understanding to erect a fence around the Japanese. In the United States, in Canada, in Australia, in New Zealand, in British South Africa, the Japanese may not enter as immigrants. Russia, while outwardly friendly, does not want the Japanese. In China, the Japanese may not own land or reside outside the Treaty Ports. Only a few South American countries welcome the Japanese and they are going there now in limited numbers, but as their colonies progress and grow wealthy, the time will arrive when the thrift and industry of the Japanese will engender jealousy and hatred and an agitation will be started to deprive them of their holdings and exclude them from the lands they have reclaimed

and brought under cultivation. No more Japanese will be wanted.

In other words, we are doing to Japan exactly what the European Powers did to Germany, but with this difference. Whereas, the Germans who desired to emigrate had the whole world to choose a home in, the doors of all desirable countries are closed to the Japanese. They must remain at home and eke out an existence as best they can. In their great pride of race, unwilling to force themselves upon people who do not want them, and with a sincere desire for peace, friendship and understanding, the Japanese have accepted these conditions and as a result we are witnessing the working of the same economic forces that in a few decades transformed agricultural Germany into the foremost industrial nation in Europe.

Japan is now a highly developed industrial state, buying raw materials wherever she can find them, transporting them to her mills and factories and exporting the finished products to whatever markets are not fenced in with high protective tariff walls. Japan has no natural resources other than the labor of her people and to utilize this to the fullest advantage she has had to transform herself into an industrial state. This she has accomplished at such a rapid rate that she is now practically self-sufficient, closing her markets to many lines that were formerly supplied from abroad. Japan is now a formidable competitor and rival to those nations whose immigration laws forced her into industrialization to absorb her increasing population. Exactly the same as was done to Germany.

Japan has arrived at the end of a road. If she is to exist peacefully, she must be permitted free access to raw materials wherever found, and be assured of markets to dispose of her manufactured products. We barred out her emigration and if the doors to her commerce are also closed, it condemns her people to slow starvation and extinction.

It is folly for arm-chair economists and birth control fanatics to tell the Japanese that they must abstain from having children when there is no check on the increase of their more prolific neighbors. For Japan to adopt such measures would only lead to a repetition of what happened in Europe. Five hundred million Chinese with a mania for procreation, intensely nationalistic, developing rapidly into a formidable military menace, and taught to look upon Japan as their national enemy, are not particularly pleasant neighbors for a nation whose people are advised to sterilize their women. We cannot visualize the Japanese accepting such conditions as the price of their being permitted to exist.

Japan has conformed to the new trend of world opinion and discarded the time honored method of solving her food and population problem by conquest and annexation. While clinging tenaciously to a minimum of armaments to defend herself against outside aggression, Japan whole-heartedly accepts every new proposal that makes for world stability and peace. She has played the international game fairly and honorably, living up faithfully to all her commitments, trusting that in due time she will receive a square deal in matters that affect her own existence.

In effect, Japan says to the rest of the world; you have denied to me the right to expand by force of arms; you have broken down my defenses in Asia compelling me to retire my armies from Manchuria and Eastern Siberia when if left alone, I would have found an honorable solution to my problems and acquired an outlet for my people and their energies; you have opposed my commercial expansion in China and incited the Chinese against me; you have closed your doors to my people and have followed it up by attempting to shut them out of Asia. We have accepted your conditions, trusting that in time you would understand our problems and help us to solve them peacefully. In the meantime, we have kept our people at home, investing our surplus capital in creating industries to absorb their energies. But we find that as soon as we build up a market for our manufactured products, discriminatory tariffs are devised to injure our trade. If we invest our surplus capital in nearby

*Population of Japan Proper.

Asiatic countries, we are accused of harboring aggressive designs; of attempting to monopolize the trade of these countries. You inform us that our people are undesirable as immigrants and ask us to remain at home. You do not want us. We are doing our best to meet your unfair conditions and co-operate for the advancement of world peace. Although prepared to defend our national existence against outside aggression, we desire peace and the blessings that peace will bring to us. To secure this, we have in the past decade made greater sacrifices than any other nation in the world. Under the conditions you have laid down, our future prosperity can be guaranteed to us only by a lasting peace and that free interchange of commodities that will enable us to work out our salvation in free competition with older nations who have the advantage of a century of experience over our manufacturers. We are far behind you in industrial efficiency. We have much to learn in scientific and technical matters but we accept cheerfully the handicap and are willing to enter into the competition if we are conceded a fighting chance to obtain raw materials for our factories and hold the markets we secure in honorable competition.

You ask for World Peace. We Japanese have gladly thrown overboard the policies your pre-war Imperialism forced us to adopt, and we have made every sacrifice to assist in attaining this common goal of humanity. There is, however a limit to our pacificism. If our right to exist peacefully be denied us; if we, of all the peoples of the world, are to be singled out for extinction by having birth-control forced upon us and our trade handicapped by unfair and discriminatory tariffs, the day will arrive when self-preservation may compel a change in our pacific attitude.

This is the message we read into the address of Mr. H. Yokotake before the Rotary International. It breathes no threat. It makes no demands. It predicts no grave consequences. It presents Japan's case openly and frankly, appealing to all peace lovers for sympathetic consideration of Japan's urgent needs. Mr. Yokotake faithfully reflects the viewpoint of his Government and the Leaders of Big Business in his country. These men, above all other things desire Peace, and for the past ten years have made sacrifice after sacrifice, in order to create a better understanding of Japan's problems. They imposed their program upon the dominant military party and brought Japan within the ranks of the Liberal Powers. But the men who compose this group and mould the policies of the Empire are not pacifists. Samurai all, imbued with the high ideals and chivalry of a virile fighting race, they would die to the last man rather than accept meekly the ultimatum so thinly concealed in the present world inattention and indifference towards their problems.

Japan asks for a square deal. She is entitled to it. She has played honorably her part in the international game of politics and expects honorable treatment in return. John Hay conceived and promulgated the doctrine of the Open Door as a basic American policy for the preservation of China's integrity. Japan accepted it without reservations and staked her existence in a war to defend it. Junnosuke Inouye, the financial diplomat, economist and statesman who now directs the finances of Japan, is the author of a new doctrine based on the same high principles that John Hay so successfully appealed to thirty years ago. The Inouye Doctrine of Equal Opportunity in world trade, an Open Door to the raw materials of the earth for all nations and a levelling of tariffs, is a natural corollary to the Kellogg Pact for the Renunciation of War and the London Naval Treaty. With these guarantees against the outbreak of hostilities between the signatory powers, the cultivation of international friendship and understanding is immeasurably facilitated and the way paved for full and frank discussion of vital world problems in open conference.

Press dispatches announce that Mr. Inouye is considering calling an international round-table conference to discuss the lowering of tariffs as the only means of breaking the present deadlock of world commerce and industry. His colleagues in the cabinet are enthusiastically supporting him in this matter. The call for such a conference is overdue. As we conclude this article, the estimates of the new Japanese census reveal that the total population of the Empire is expected to approximate 90,000,000, an increase of 13,000,000 in ten years. With her present limited supply of food and raw materials Japan cannot continue to provide for the welfare of these mounting millions unless the bars are let down somewhere

to her emigrants, or, if this be rejected, then a lowering of tariffs that will enable these millions of industrial workers to remain at home and compete on equitable terms for the right to exist. To deny to them the right to emigrate and then create tariff barriers that close the markets of the world to the products of their toil, is sentencing them to starvation, misery and death. The ninety millions of Japan will not meekly accept such a verdict.

No matter how peacefully inclined their present rulers may be or how honorably and sincerely they may strive to preserve peace; if their overtures for equal opportunity are rejected; if there is no relief in sight for the toiling masses of Japan; a new government will be elected to direct the affairs of the nation. Liberalism will give place to Nationalism, if not to Aggressive Militarism. The lid will blow off just as it did in Europe. Without sympathetic international co-operation for the solution of these problems, there can be no peace and Civilization itself will disappear, swamped by the rising tide of Communism.

Out of sympathy for China's defenseless position in 1898 and to preserve her territory from partition by the Powers, John Hay boldly enunciated the doctrine that for the past thirty years has been instrumental in preserving intact her national existence. American diplomacy is conceded the credit for promulgating a paper doctrine, but it was left to Japan to defend it by force of arms. That China is to-day a sovereign state, taking her place in the family of nations on a footing of equality, is due to Japan's sacrifices in 1905. Had Japan failed, China would long ago have passed under the domination of the Slav.

History repeats itself. China, helpless and disunited, is once again facing the menace from the North and the only nation that can come to her assistance is Japan. Forces are again at work in Asia that compel the attention of the world. In ten years, Japan's population has increased 13,000,000. China's increase is conjectural, but it is in the same alarming proportions. Where are these millions of Asiatics to find elbow room? The West has closed their doors to them, so the pressure must find its outlet in the waste spaces of their own continent.

The people of Soviet Russia are maintaining, if not exceeding, their pre-war fecundity. Russia is doubling her numbers in less than 50 years. In another decade there will be an additional 30,000,000 Slavs seeking an outlet in Asia. In the same space of time there will be an additional 100,000,000 Chinese and 13,000,000 Japanese clamoring for the right to exist.

When, ten years ago, we assumed this estimate in our original article entitled "Japan's Right to Exist," statisticians, population experts and birth control advocates ridiculed this forecast as pure speculation and advanced many causes that would operate to keep down the increase. We will soon have the official figures of the Japanese census to support their preliminary estimates of 90,000,000. Last month, at a session of the International Institute of Statistics held at Tokyo, a conflict arose between the American and Chinese delegation over the total population of China, the American insisting that 342,000,000 was about right, while the Chinese claimed 445,000,000. Nanking has since announced that according to statistics now being compiled by the Ministry of the Interior, the total number of people of the country, is not far from 500,000,000. This, despite the millions who have died of famine, starvation, civil wars and other horrors! Our forecast was lower even than these estimates. In our opinion, it is futile to apply Western standards and rules to a people whose civilization is based on ancestor worship and whose chief characteristic is a reckless procreative mania, with no thought or care of how their progeny will be provided for. How can we expect Japan to practice birth-control when her next door neighbor must find room for about 50,000,000 new mouths every decade? The ceaseless civil wars in China are merely the desperate struggle of these famishing millions seeking an existence denied to them in industry, agriculture or honorable labor; the World War waged on an isolated stage.

Soviet Russia is embarking on a program that will absorb its millions in industry and agriculture and in another decade at the rate she is progressing, will become a formidable industrial competitor, monopolizing the markets of Asia and reaching out over the world for other outlets for the products of her communistic toil. Russia is self-contained and if necessary can absorb her increase from within for the next half century. China is also largely self-sufficient, but the pressure of these prolific people will force them out further and further into the waste lands of Central

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Over-Population: Japan's Basic Problem

General Observations

By HEITARO YOKOTAKE, Japanese Commercial Counsellor

(1) GROWTH OF POPULATION.—According to the official 1929 Statistical Year Book of the Japanese Empire, the growth of population in Japan Proper for the decades 1872 to 1928, is as follows:—

Years	Total population	Annual increase	Rates per 1000
1872	33,110,796	unknown	do
1882	36,700,079	341,124	9.18
1892	41,089,940	371,263	9.12
1902	46,041,768	595,399	13.10
1912	52,522,753	768,819	14.86
1922	59,460,252	763,116	13.00
1923	60,257,931	797,679	13.42
1924	61,081,954	824,023	13.67
1925	62,044,649	962,695	15.76
1926	63,006,595	961,906	15.50
1927	63,862,538	855,943	13.40
1928	64,824,798	962,259	14.84

Before the Meiji Restoration of 1868, Japan's population remained almost stationary between 28,000,000 and 32,000,000 for nearly 200 years. From 1872 to 1922, there was an increase of about five million people every ten years, due largely to the development of home industries and foreign trade, which followed the passing of the feudal system. During this period, Japan could without difficulty supply her own food requirements, but since the close of the World War, owing to the high cost of living and abnormal increase of population the problem of existence has become more and more difficult. Since 1925 to date, the increase of population has averaged 900,000 per year.

Hence Japan's basic policies, domestic as well as foreign, hinge upon a solution of the vital problems of population and foodstuffs.

(2) POPULATION AND CULTIVATED LAND.—The average total land area per unit of population in Japan, is only 0.10 hectares while other densely populated countries such as Great Britain, Netherlands and Switzerland enjoy 0.12, 0.13 and 0.13 respectively. Compared with the United States, Japan's share is less than one-tenth.

(3) IMPORT OF FOODSTUFFS.—The relation between population and food supply in Japan is revealed in the fact that despite an annual home production of 300,000,000 bushels of rice and 116,000,000 bushels of wheat, Japan imports annually some 37,500,000 bushels of rice valued at about Y.230,000,000 from her dominions, Korea and Formosa. In addition, Japan imports from other countries, rice, wheat

and other foodstuffs to the annual amount of some Y.300,000,000 as shown below: (In Y.1,000).

Articles	1929	1928
Rice and Paddy	22,782	33,678
Wheat	70,896	67,787
Beans	78,744	67,858
Eggs	3,983	6,960
Sugar	31,160	64,959
Beef	7,156	6,972
Others	56,435	50,334
Total	271,136	298,543

(4) SUMMARIZING THE FACTS:—

- Japan ranks first among the Powers in the annual increase of population.
- The density of population of Japan in proportion to the cultivated land areas is the largest among the Powers.
- Agriculture, the basic key industry in Japan, using the most intensive methods in the world, absorbs nearly 53 per cent. of the total population.
- The potential power of agriculture to absorb the increasing population of the country is declining annually.
- Every foot of land available for cultivation is utilized to the greatest advantage.

(f) On the one hand, the law of diminishing returns has commenced to operate on all cultivated lands despite improvement in farming methods, use of fertilizers, irrigation, etc.; on the other hand, the extension of cultivable land has come to an end.

(g) The population is continually increasing, while an increase of foodstuffs is almost impossible. The balance between population and foodstuffs will be more and more intensified.

(h) Under these conditions, Japan must support her population by the development of other industries besides agriculture in order to exist.

Relief Measures for Over-Population

(1) EMIGRATION.—According to official investigation in 1928 the number of Japanese residing abroad is estimated at about 700,000, distributed as follows:—

China	258,000
America	141,000
Hawaii Islands	130,000
Canada	22,000
Brazil	76,000
The Philippines	14,000
Peru	16,000
Others	62,000
Total	719,000



Mr. Heitaro Yokotake

These figures represent the total emigration over a period of sixty years, or a little over 10,000 emigrants per annum. Compared with the present increase of population of some 900,000 per annum in Japan Proper, these figures count for almost nothing in reducing the pressure. The poor showing is due mainly to the practical exclusion of Japanese by the Anglo-Saxon countries in the Pacific area.

Although some South American countries welcome the Japanese, at the best they can absorb only a limited number of Japanese colonists. Poor transportation facilities, difficult living conditions, climatic and other disadvantages, operate as handicaps to any great volume of emigration to those countries.

In China, Manchuria, Siberia and the South Seas, where capital, brains and labor are needed for development, Japanese emigrants cannot compete with the lower living and wage scale of the native population. Under these circumstances, Japanese emigration is practically at a standstill, with no relief in sight unless and until suitable outlets can be legitimately found somewhere in countries bordering on the Pacific.

(2) BIRTH CONTROL.—At present, birth control is tacitly allowed by the Japanese Authorities so far as this practice is not in contravention of the civil laws and peace and order of the country, although contraception, not to speak of abortion, is absolutely against national traditions and ideas. Alarmed by the ever-increasing birth rate, the Authorities are considering enforcing necessary laws to meet the situation.

Human nature is pretty much the same in Japan as in other countries. The masses who cannot provide for their offspring are invariably the most prolific and resent any attempt to impose official birth control measures while the upper and middle classes who can amply afford to raise and sustain large families voluntarily practice what Roosevelt so vigorously condemned as "race suicide."

From this it will be seen that in spite of the Government's mild attitude towards birth control, over-population cannot be relieved by these methods so long as national traditions and present social conditions remain unchanged.

(3) INDUSTRIALIZATION OF THE COUNTRY.—Industrialization is strongly advocated by influential politicians, scholars and business magnates for the absorption of the increasing population. This plan, if practicable, will be most ideal and effective, since there will be no need for Japan to export her surplus labor to foreign countries where they are not wanted. The Japanese are a proud people. They will never play the part of "unwelcome guests." Rather than force themselves upon other people they prefer to remain at home and export the products of their toil.

Unfortunately, however, Japan lacks raw materials and cannot expand her domestic industries without dependence upon foreign sources of supply. Japan imports yearly raw materials from foreign countries valued at Y.1,200,000,000, in addition to foodstuffs valued at Y.1,300,000,000, a total import of foodstuffs and raw materials, valued at some Y.1,500,000,000 or approximately 68 per cent. of her total imports. So we have to face the truth that Japan cannot realize her aspirations to develop into an industrial nation with her limited natural resources.

These facts indicate that all measures mentioned above are merely palliatives and cannot bring lasting relief. What hope then, is left for Japan?

Only Hope

(1) PEACE.—Great changes in international relations have taken place in the last decade. After sacrificing millions of lives and mountains of treasure, the World War resulted in national suicide for the Central Powers and economic impoverishment for the victors. Conquerors and conquered went down to defeat. The world has been taught a much needed and costly lesson. War does not pay; it settles nothing. Reflecting upon the tragedies and horrors of Armageddon and the inability of war to settle international disputes, the world welcomes the new doctrine of renouncing war as an instrument of national policy and acclaims the spirit of international conciliation and concord.

It was only natural that President Wilson's "Fourteen Points" were embodied in the Covenant of the League of Nations. The growth of internationalism since 1919 is due a more rapid development of world civilization as compared with pre-war conceptions of selfish and narrow nationalism. The Treaty of Versailles ushered in a new epoch. As the civilization of any one country or people

is merely the outward manifestation of the material and spiritual co-operation of individuals and groups, so world civilization can be advanced materially and spiritually by the solidarity and interdependence of the nations. Without this spirit of international conciliation, concord and recognition of each others' problems, there can be no world peace and civilization itself will disappear.

It is true that Japan has her own "Big Japan" group just as England and the United States have their own "Big England" or "Big Navy" cliques. In every country through all the ages, there have been jingoists or chauvinists and Japan is no exception to the rule.

The great mass of the Japanese people have remained indifferent to the panaceas of political agitators, however, high-sounding they may be. The suffering masses are so desperately engaged in earning their daily bread that they have no time to listen to the mouthings of blatant jingoists, militarists or expansionists. The bitter experiences of the Great War and the Greater Earthquake and Fire in 1923 haunt the Japanese like a nightmare. The masses of Japan will not dance to the tune of their militarists.

It should be recalled in this connection that when a controversy arose between the present Japanese Government and the Naval General Staff over the London Naval Treaty, one of the most influential Tokyo dailies declared editorially: "*Even though the Chief of the Naval General Staff may be regarded as an officer directly attached to the Emperor as the supreme Commander-in-Chief, yet this officer does not constitutionally have the right to decide the political wishes of the nation.*"

Based upon the firm belief that their action would be wholeheartedly endorsed by the entire nation, the Japanese Delegation to the London Naval Conference signed, it is believed, the epoch-making treaty for the great cause of world peace, contrary to the expressed views of Naval experts and other militarist influences. This is generally interpreted as a great victory for liberalism in Japan. Brought face to face with the vital problem of feeding its rapidly increasing population, Japan chooses to exhaust every honorable method that will enable her people peacefully to survive in the struggle for existence. For that reason she was willing to accept any limitation of naval armaments as a step towards the goal of permanent peace and to base her hopes of a fundamental solution to her problems on some international agreement for the control of raw materials and an Open Door for world trade.

(2) FREE TRADE.—Generally speaking, Japanese statesmen and business men are divided into two camps: one advocating protection, the other free trade, the former demanding protection of infant industries from the viewpoints of "self-supplying," and "self-sufficing" of industrial materials and foodstuffs, while the latter advocates the free movement of materials and foodstuffs throughout the world.

That Japan is pre-eminently a free trade country is evidenced by her Customs tariff. Most of her imports, raw materials, as well as foodstuffs, are duty-free or subjected to a tariff lower than in Great Britain, United States, France, Germany and Italy. At a time when the free-traders of Japan are advocating a lower standard of duties and readjusting their present tariff schedule, the tendency of other great Powers to erect higher and higher tariff walls is to be deplored. The general world economic tendency is to monopolize raw materials and markets by a few "privileged" Powers, with the result that in some countries Japan's exports are actually "boycotted" or discriminated against.

In this struggle for existence, Japan's only hope of salvation by peaceful methods is to lead the movement for a world-wide lowering of tariffs and freer interchange of raw materials and manufactured products. The Powers which agreed on naval disarmament to promote the cause of world peace, should now turn their attention to "tariff disarmament," without which permanent peace will never be realized.

(3) INTERNATIONAL "OPEN DOOR."—According to my humble opinion, the worst obstacle to world peace lies in artificial interference with international economic movements. The world of to-day has emerged from the age of nationalism and is entering a new era of international economic interdependence.

Politically, we have outgrown the age of "splendid isolation," and are now entering triumphantly upon an era of international solidarity. We discuss and settle all our international political disputes at round table conferences, but in matters of economics nations are fast returning to the age of "splendid isolation,"

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Divided You Fall

Get Together, China!

IF Nanking is to be the seat of the recognized government of China, responsible to the world for the observance of treaties, repayment of obligations and other fundamental functions of an organized state, it must have the power to control absolutely the finances of the nation through one central agency, the Ministry of Finance. There can be no two or more separate governments, trying to raise loans abroad for regional development schemes secured on their own revenues without the guarantee of the Central Government. Such guarantee obviously cannot be extended until the nation is completely unified under a responsible government and then only in exceptional cases where financial supervision of the projected development is under the ministry of finance or railways.

Attention is called to this matter by the report that the Manchurian Government is negotiating with a German syndicate for a loan of fifty million dollars (presumably silver) for the construction of new railways in Manchuria and Mongolia that will connect (1) Tungliao with Taonan and reach Heiho by the way of Tsitsihar, (2) Kirin with Suifen *via* Muling and Taokow and, (3) starting from Hulutao to reach Urga *via* Jehol. As we pointed out in our editorial on "The Menace from the Direction of Urga" and other articles in the September number of this magazine, the construction of these lines, especially the line to Urga, cannot be postponed if China is to be prepared to defend herself against the forward policy of Soviet Russia. The construction of the Hulutao-Urga line, as the first section of the Central Mongolian trunk railway to Kuldja, Urumachi, Ili and Kashgar, with its feeders terminating on the northern Mongolian border, should take precedence over all other construction, if China's territorial integrity is to be preserved.

Mongolia, supported by Russia, has declared its independence and any attempt on the part of China to regain control over this territory by means of railways may precipitate a war that would bring the Soviet to the assistance of its protégé. The rapid extension of Soviet influence in Sinkiang, whose population is largely Mohammedan and hostile to Chinese rule, presages the ultimate loss of this rich province with its untold wealth in oil, precious stones, and minerals. It is reported that the number of Russians in Sinkiang is now nearly as great as the Chinese. Soviet banks have their branches in Urumchi, Ili, Kashgar and other frontier trading centers, issuing paper notes and extending their financial and economic grasp over a community that reposes little faith or hope in the Chinese banks or government. Long before the Chinese can build a railway into this province and consolidate their authority, it will be transformed into a Soviet economic sphere of influence; the first step towards its political independence and absorption in the Union of Soviet Republics.

China has to act quickly to hold these distant provinces, and it is safe to predict that whatever she may do, will be checkmated in some way by Moscow. Whether China will be permitted to hold even the Barga region, depends upon the celerity with which the nation comes together to present a solid front against the menace from the North. There is every reason to believe that the Chinese railway program in North Manchuria has alarmed and forced the Soviet to take action long before it was prepared. The immediate storm center and bone of contention is the Barga region, towards which the Chinese are now laying the rails of a new line starting from Tao-an, passing up the Tao Valley to Solun, thence over the Kinghan range into the Barga region to Hailar, Manchuli and the Siberian frontier. Although designed for the private profit of the group of Manchurian war-lords who own most of the waste lands, the line is highly important strategically, driving a wedge between the Barga Mongols and those of Outer Mongolia and providing direct access and transportation for Chinese colonization on the most vulnerable frontier of Mongolia. It can be used to divert the traffic of this rich agricultural and grazing region from the Chinese Eastern railway to a line that will carry the produce southwards towards a deep water outlet within Chinese jurisdiction, relegating the C.E.R. to the position of a through international

artery of communication. This constitutes a direct challenge to the Soviet position and long before the Solun-Manchuli line reaches Hailar, it must force the Soviet and the Mongols to a show-down on the question of China's sovereignty over Mongolia. Unprepared and disunited, the Manchurian overlords in their hunger for new revenues are precipitating a major issue that can only be tackled by a united nation.

There can be no mistaking the determination behind the strong diplomatic Soviet Note recently handed to the Mukden Government protesting against the activities of the so-called White Russians in North Manchuria. It is to be noted that Moscow completely ignores Nanking and addresses its communication to the responsible authorities in Manchuria. Moscow openly accuses the Chinese of aiding and abetting the unlawful acts of the White Russians and calls upon Mukden to take "immediate action" to suppress them, creating a clear cut issue that can be employed to justify retaliation in the event it is not satisfied with China's response. China is not dealing with a group of Western Powers whose intense rivalries and jealousies have tied their hands and committed them to pacific methods to preserve their trade and investments in this country, but a rejuvenated nation, that cares nothing for world opinion and is safe from any outside interference. The destiny of Asia hinges on whether the Slav or the Mongol is to reign supreme in these regions and if the past is any criterion for the future; if we remember that Russian policy never changes, there is only one termination to a situation now rapidly approaching a crisis.

That Moscow is preparing for a show-down with China and collecting materials to defend her position before the world, is plainly evident. Moscow is energetically preparing the public for the possibility of serious complications in connection with the Chinese Eastern Railway and has brought the Sino-Soviet Conference to a dead-lock, from which China can emerge only by fulfilling the terms of the Habarovsk protocol. Should Moh Teh-hui pack up and depart from Moscow, it would only inflame the Russians and serve as a pretext for precipitating further disasters upon China, which amongst other things, would take the form of a demand for the independence of Barga, on the grounds that Mukden is powerless to exercise its authority over the region and prevent the lawless raids of White Russians into Soviet territory. If Moscow presents its case along these lines, the outlook is not a cheerful one for China and when we read that Mukden is now seeking a foreign loan for railway construction in these regions and has turned to Germany for financial assistance, it conveys to our mind the utter irresponsibility of the Chinese, another evidence of their traditional inability to recognize the facts of a situation.

The situation is almost incredible. Last year, while Nanking was fighting for its life in the South, the Kirin war-lord threw down the gauntlet to Moscow by kicking out the Soviet directors of the Chinese Eastern Railway, precipitating a state of war, in which actual hostilities were not undertaken on a large scale, simply because Moscow was not at that moment prepared for such adventures. Even the Young Marshal, refused to send his best troops to the assistance of his subordinate and let him bear the brunt of the one-sided campaign. Before even the dispute is settled and while the Chinese plenipotentiary is cooling his heels in Moscow awaiting the Soviet's pleasure to open the negotiations, the same group of Manchurian war-lords start the construction of a railway into the disputed Barga region, a clear cut challenge that Moscow cannot ignore without losing its prestige with the Mongols and other tribes of Central Asia. Nanking, the responsible government of China, fighting for its very existence in China proper, must again face a crisis brought on by a group over which it has absolutely no control.

Mukden has never recognized the authority of Nanking in its internal affairs nor has it surrendered control of its transportation lines to the Ministry of Railways of the Nationalist Government. In this, Mukden has declared its independence of Nanking and made impossible any real unification of the State Railways

or central control over their finances which would permit the carrying out of any comprehensive national plan for their administration, rehabilitation and extension. Mukden has carried this conception of its independence to the point of establishing its own railway purchasing bureau, its own Northeastern Communication Commission and has even dispatched its own agents abroad to raise loans to finance new construction. Last year, it succeeded in interesting one of the most powerful contracting groups in the United States. This group sent its own representatives to Manchuria to investigate conditions and negotiate a contract for the construction of the Solun-Manchuli line, just at the particular time when the "war" with the Soviet was at its height. Mukden knew it could not deal openly with any financial group requiring the consent and support of the American, British, French or Japanese Governments and that any loan through such agencies would have to be negotiated through the Consortium. So it found an American contracting firm whose world-wide activities were financed under a plan whereby it accepted the bonds of the foreign government in payment for its work, locking them up in their own vaults and issuing their own securities to the public to finance the job. This system had worked wonderfully well with various smaller governments whose finances, while somewhat shaky, were considered a good risk, and it looked as though it would work smoothly in Manchuria under a plan where Mukden would issue Manchurian bonds in payment for the construction, while the contractors through their banking group, would issue their own bonds to the public. The scheme was an attractive one, but it was merely "beating the devil around the stump," trying to get the best of the Consortium by placing a Chinese loan on the market concealed behind a private issue. Needless to say, the scheme failed. The State Department, or perhaps Mr. Lamont, very effectively laid down the law to the American contractor and their financial backers and the upshot was a sudden change in the program. Mukden was informed that it would have to pay in cash for work accomplished.

With the American, British, French and Japanese markets closed to Mukden by an official combination of international bankers recognizing Nanking as the Government of China, Mukden's schemes fell through and no more has been heard of them, until it is now announced that it has found another way to beat the embargo through a German syndicate. On its face, the report bears every earmark of credibility and we arrive again at another attempt to circumvent the Consortium through an outside nation that can float its own loans or credits on the American market and use the proceeds to carry out vast development schemes closed to American initiative.

It is inconceivable that the hard-headed Germans, even in their present desperate need for markets, would take a chance in financing railways in Manchuria and Mongolia on any security extended by the provincial authorities without the full approval and consent of Nanking and its guarantee that the loan will be repaid. If Nanking is willing to sanction any such impairment of its authority, involving the national credit for new railways in territories outside its jurisdiction, these lines should come under the operating control of its Minister of Railways and their location and terminals made to conform with the national scheme of railway expansion and strategic defense. If, on the other hand, Mukden is permitted to negotiate this contract with a German syndicate without Nanking's guarantee and supervision over the construction and operation of the lines, it constitutes a recognition of Manchuria's complete independence and the end of the fiction of China's unity.

The entrance of German influence in Manchuria and Mongolia is to be deplored. Granting that such a move conceals no political motives, when viewed in the light of other significant developments, it gives rise to justifiable suspicions of some understanding between Moscow and Berlin. Every indication points to the conclusion that there exists as close a connection between the Soviet and Germany as formerly united Russia, Belgium and France for the furtherance of the Czar's program of conquest in Asia.

In this picture, we see Germany and Russia working together for the advancement of their mutual economic and perhaps political interests united by a common hostility towards the Power which has blocked their expansion for the last century. With the doors of all Allied countries closed to its people, Germany looks towards Russia and Siberia as an outlet for her surplus population and manufactured products; her experts have thoroughly explored the mineral possibilities of Central Asia and pronounced them the richest in the world; her technicians and skilled workmen are direct-

ing and operating many of the Soviet's basic industries; a German syndicate has the concession to build and operate a net-work of Afghan railways that link up with the Soviet Central Asian system and terminate on the borders of India; German military advisers have superseded Soviet generals in the direction of the Nationalist armies and wield a powerful influence in Nanking; the French, always suspicious of Germany, only a few months ago discovered what they claim is a secret military alliance or understanding between Germany and Russia under the terms of which German aviators are building up an air-force in Russia; a German aviation company has entered into a contract with the Chinese Government for operating a service between China and Europe, using Soviet landing places. If the Germans now succeed in financing the construction of China's strategic railways in Mongolia and Manchuria, the world will wake up to find that the railway communications of the two buffer states of Afghanistan and Mongolia, the only barriers to the Slav domination of Asia, are controlled by a country in close sympathy with Russian expansion.

All this may be imaginary. It is just as easy to see in these moves the natural working of legitimate economic and financial forces. If we accept the premise that the Chinese have carefully considered the future political complications and possibilities of such a program and with their eyes open have invited German co-operation in the development of Mongolia, thus playing indirectly into the hands of Moscow, then we return once more to the same alarming and explosive situation as when in 1896, Li Hung-chang signed a secret treaty of alliance with Russia aimed at Japan and handed over Chinese territory for the construction of military railways to facilitate the transportation of the Russian armies to the Korean frontier, and ceded to Russia a deep water port that for the first time gave the Czar's fleet an outlook on the Pacific. If China openly, secretly or unwittingly, should once more align herself with Moscow and place Japan's vital economic and strategic interests in Manchuria in jeopardy, it will be difficult to restrain Japan from taking such steps as she considers necessary for her security.

If, on the other hand, recognizing the imminent peril in the Soviet program, and with no hope of obtaining assistance from the Consortium Powers, China has turned to Germany for help, it is difficult to criticize either party. While regretting the entrance of German influence into these regions on broad political principles as provocative and unwise, it is perhaps the only immediate solution to China's problem, short of an understanding with Japan. In view of the grave political possibilities attendant upon the entrance of Germany into the Mongolian and Central Asian regions, China would do well to consider it from all angles and in the end align herself with her natural racial ally and accept Japan's assistance in the development of a system of strategic railways and defenses in Mongolia than mean as much if not more to Japan than to China.

We repeat what we had to say last month:

If "there is any real statesmanship in the Nationalist Group, it will seek by every means within its power to conciliate and make a firm friend of Japan, the Nation that for the next two or three decades will have the final say as to who shall be Master in Eastern Asia. The day is not far distant when China will need Japan's friendship and support. . . . Japan is now the dominant factor in the Far East. On how she swings her friendship and support to either the Soviet or China hinges the future of Asia and the fate of China."

The absence of any common policy or central control over the Manchurian war-lords makes impossible the formulation of any definite program on the part of the recognized Nationalist Government towards a solution of these pressing and dangerous problems involving the very existence of the state. At a time when a state of war or at least an armed truce exists between China and Russia, with negotiations for a friendly settlement not even fairly opened; when the people of Russia are being more and more inflamed against China for her inability to suppress the White Russian bands operating in the Barga region and demanding immediate reprisals; at this time of great national peril when China's only hope of friendly assistance lies in the support of Japan, the Manchurian war-lords through their Northeastern Communications Commission, are devising ways and means to redeem the three railways built by Japanese capital for the Chinese Government in order to eliminate Japanese control over these lines!

China would be most unwise at this moment of suspense to commit herself to any program that might antagonize Japan. It

is a foregone conclusion that the Soviet will oppose the construction of any railway in Mongolia that opens this territory to Chinese colonization and control. In this, she merely adheres to the traditional Czarist "Monroe Doctrine" to maintain Mongolia as a buffer state against the expansion of the Yellow Race, a doctrine that the old régime was prepared to defend by force of arms. The Soviet will not depart from this basic doctrine of national security, unless the game plays into its hands.

We would be the last to question the motives of the German syndicate interested in this development or would we knowingly engage in criticism calculated to deprive their manufacturers of much needed markets, but we are frank to say that if the reported railway contract with Mukden is carried out, and Moscow makes no protest, or takes no steps to enforce it, it will be accepted as clear evidence of the existence of some secret understanding between Berlin and Moscow to which China has unwittingly or otherwise acquiesced. If unfortunately, this is to be the line-up in Asia, if this is China's answer to Japan and the Western Powers, the threat to Japan will sooner or later compel a new alignment of the Powers to defend themselves against the Sovietization of Asia, or, a clear cut understanding that Japan can take her own measures for defending her vital interests, backed by the full financial power of Great Britain, America and France.

The time has arrived when the Consortium Powers should seriously consider a revision of their negative policy towards China, getting back to the original idea that influenced President Wilson

to reverse himself and invite its formation. If it was considered judicious and statesmanlike in 1917 to finance China with the sinews of war to pit her against the Central Powers, then it is still more prudent and sensible in 1930 to formulate some program that will enable the Consortium to place China in a position to defend herself against the menace from the direction of Urga. The promise of this financial support would exert a powerful influence in establishing a strong central government in China and unite all factions to confront the danger from without. Political unification and centralized control of finances and railways must precede any outside financial assistance and although such assistance might firmly solidify and perpetuate the rule of the group in power at the moment, even this is preferable to national defeat and dismemberment. If China cannot unite and place herself in a position where outside help can be freely extended to her; if selfish considerations and desire to handle the funds on the part of grasping war-lords continue to impede unification and concerted national action, then China is unworthy of any sympathy or help from the outside and the Powers interested in preserving her sovereignty and territorial integrity will either have to actively intervene or stand aside while the Soviet gains the ascendancy and makes good on its threat to utilize China as a spring-board for World Revolution. Unless something is done to bolster up China from without, within ten years the Communists will rule the country. Get together, China!

G.B.R.

The British Boxer Indemnity

THE final disposition of the remitted British portion of the Boxer Indemnity fully justifies the vigorous stand taken by this magazine in 1924 for the employment of these funds for railway construction. When Parliament passed legislation for the remission of the British share of the indemnity, this magazine in the face of an almost solid opposition, advocated that the greatest benefits to both countries could be attained only by constructing railways which would provide a much needed outlet for British railway materials, at the same time creating new sources of revenues in China whose surplus could be earmarked for educational purpose. In an editorial in our July 1924 issue, under the title of "*Build China's Railways—A Practical use for the Boxer Indemnity*," after criticizing the American Government for breaking away from the terms of the Boxer Protocol and its implied international commitments by remitting its share of the indemnity for educational purposes and advocating the employment of the remitted Boxer funds of all countries for railway construction, we concluded with the following paragraph:

"America expects other Powers to live up to the joint obligations imposed upon them through the Consortium and the Four Power and Nine Power treaties. In these matters, faithful adherence to the principles involved are calculated to preserve American ideas of what is best for themselves and for China. Other powers, are however, more interested in the material development of China than in her cultural and educational progress. America has broken away from her associates in order to advance her special cultural interests at their expense. The time has arrived when there should be a coming together on these matters and if America expects cordial and loyal co-operation, there should be some reciprocity, some sacrifice of our ideals for the benefit of our associates. This article shows a practical way out, one that can be applied with advantage to all. At the rate we are going, the present generation will be dead and forgotten by the time the consortium is ready to function. In the meantime, China rots and decays for lack of transportation facilities, while foreign firms are being forced one by one to the wall through China's inability to meet her obligations. *Education, sanitation, cultural and spiritual uplift will not solve the problem. Loans to China at this time are out of the question. Colleges will not build railways, but railways will build colleges. Let the Boxer Indemnity do the work.*"

The above editorial was followed by an exceptionally strong authoritative article on Chinese railway conditions contributed by one of the best informed British railway experts in China, entitled, "*Why Waste the Boxer Indemnity in Education*."—"Build Railways and Provide Employment for the Masses." These arguments were reinforced in a further editorial in our October 1924 issue, entitled, "*The Full Rice Bowl; Common sense and Practical Christianity Applied to the Boxer Indemnity*." In the meantime our views were brought to the attention of the Federation of British Industries, which reversed its original recommendation that the funds be used for educational purposes and urged upon its government that industry be represented on the committee to decide the purpose to which the Boxer Indemnity should be put.

In those days, the British missionary and educational element, emulating the American precedent, were clamoring for the allocation of all the remitted indemnity funds for schools and colleges. Public opinion favored this viewpoint and those who took a more utilitarian view were termed sordid and mercenary materialists. Had our original recommendations been acted upon and the Canton-Hankow Railway pushed to completion in 1924, the British would not have had to undergo the humiliating disaster of the Canton and Hong-kong trade boycott and a loss of prestige throughout China that culminated in the Hankow surrender. The whole course of Chinese history might have been changed had a more practical policy prevailed in the disposition of the Boxer funds at that juncture.

Tardily, under severe economic pressure, the pendulum has swung the other way and we welcome the change in policy that will alleviate unemployment in England, assure a full rice-bowl to millions of starving and despairing Chinese and still advance the cause of education. The terms of the new agreement for the disposition of the British Boxer Indemnity is a clear cut endorsement of the policy of this magazine; using the bulk of the funds for rehabilitating and building railways for the creation of an endowment to be subsequently devoted to educational purposes. The details of the agreement are as follows:—

By an exchange of Notes effected on September 19 and 22 between Dr. C. T. Wang, Minister of Foreign Affairs, and Sir Miles Lampson, British Minister to China, it has been agreed that all payments of the British share of the Boxer Indemnity of 1901 will, subject to the necessary legislation being passed in the British Parliament, be remitted by the Government

of the United Kingdom as from December 1, 1922, to the control of the Chinese Government.

The Chinese Government will apply the bulk of the funds thus remitted to the creation of an endowment to be subsequently devoted to educational purposes by investing the said funds in the rehabilitating and building of railways and other productive enterprises in China. Such investments shall be regarded as loans bearing interest and providing for eventual amortization.

For the control, apportionment and administration of the endowment, the Chinese Government will appoint a Board of Trustees in China, in which will be included a certain number of British members.

The Chinese Government will place in the United Kingdom all orders for materials to be purchased out of the remitted funds or out of the loans secured on such funds. There will be established a Purchasing Commission in London for the purpose of making contracts for the supply and delivery in China of any machinery or materials to be ordered by the Chinese Government, discharging all obligations that may be incurred under such contracts and establishing a reserve fund out of any moneys not for its immediate use so as to meet future requirements of the Chinese Government.

The Commission will consist of a chairman (China's Diplomatic representative in London), a representative of the Chinese Ministry of Railways, and four other members appointed by the Chinese Government, after consultation with the Board of Trustees, from a panel of persons commended to the Trustees by the British Secretary of State for Foreign Affairs as being persons of standing with wide experience of business matters.

All accumulated funds now on deposit—less two sums mentioned hereafter—as well as one-half of all future instalments will be transferred to the Purchasing Commission to be used in the above-mentioned manner.

The other half of each future instalment will be transferred to the account of the Board of Trustees in China.

It is understood that the Purchasing Commission will be exempt from all taxation respecting any income accruing thereto. Certain detailed rules have also been agreed upon regarding the constitution, powers and proceedings of the Commission.

A sum of £265,000 and a further sum of £200,000 will be set aside out of the accumulated funds now on deposit to be donated respectively to the University of Hongkong for the education of Chinese students, and a Universities China Committee in London for the purpose of inviting eminent Chinese to give lectures in the United Kingdom and otherwise promoting cultural relations between China and the United Kingdom.

The British share of the indemnity outstanding in 1922 was approximately £11,000,000. A White Paper for the year ended March 21, 1929, showed an accumulated balance on deposit in London drawing compound interest, of £2,850,000, out of which the £465,000 mentioned in the agreement must be deducted, leaving some £2,300,000 immediately available for construction purposes. The stipulation that all materials are to be purchased in the United Kingdom, together with the creation of Chinese Government Railway Purchasing Agency in London, along the lines forecasted in the December 1929 issue of this magazine, assures to British manufacturers free competition in all tenders for materials and to the Chinese, the benefit of the lowest possible prices.

We have foreseen this new departure in Chinese official purchasing methods and if followed by the establishment of similar agencies in other countries supplying funds for Chinese railway construction and public works, it will have a most disastrous effect upon the business of local engineering firms representing foreign manufacturers. The British precedent while assuring full benefits to British industry is a severe blow to British firms in China. In effect, the funds are British and all British manufacturers are entitled to the full benefit of their expenditure under guarantees which assure to all competitors open tenders and equal opportunity, something which is not possible on the ground here in China, unless every manufacturer is represented. If the operation of such an office in London justifies its existence by reducing the costs of materials to the Chinese Government, the tendency will be to utilize it for the purchase of materials other than those required for the

Indemnity Railways, developing into a full-fledged Chinese Government Purchasing Office for the placing of other orders for construction materials.

If the report is true that the contract for financing the proposed Mongolian and Manchurian lines is going to Germany, it is a foregone conclusion that all the materials will be purchased in that country. In these days of worldwide unemployment and distress, there is bound to be a revival of old loan conditions stipulating that the country supplying the funds will have preference in furnishing the materials. If, in order to obtain the lowest prices arising from an open competition for all the manufacturers of the lending nation, a purchasing agency is established in its capital, the middleman in China will have a hard time holding on.

The funds immediately available from the British Boxer Indemnity should build 275 miles of new railways and the annual instalments of about £480,000 for the next fifteen years, another 50 miles a year, or a total of 750 miles, a grand total of some 1,000 miles of new railways whose construction can be undertaken at once, by issuing a loan secured on these funds. According to Minister Sun Fo, the greater part of the returned indemnity will be used to complete the 170 miles of the Canton-Hankow Railway while the rest will be appropriated to rehabilitate and improve all the Government-owned railways in the country, which if carried out, will re-establish a monopoly for British manufacturers to supply materials to the railways created in this country with British capital. This will again confine the demand for American railway supplies to those lines built by purely Chinese capital.

This constitutes a decided victory for British interests in China, one which will do more to bring peace and stability to the country by providing work for the starving masses than any other measure. Had the American Government followed our suggestion in 1924 to utilize the outstanding balance of the American portion of the Boxer Indemnity, to complete the line into Szechuen employing the profits of the line as an endowment for schools, instead of sinking the whole sum into further educational activities, American manufacturers would by now have developed a wonderful market for their products in Western China and, by eliminating traffic through the gorges and upper reaches of the Yangtze River, we would have saved the investment on a fleet of river gunboats and avoided the constant armed clashes with pirates, Reds and independent military satraps who prey upon the river traffic.—G. B. R.

* * *

The attitude of the British commercial community in China towards the terms of the Boxer Indemnity Agreement is very clearly set forth in the following leading article in the current issue of *The British Chamber of Commerce Journal* :—

"The terms of settlement of this vexed question have now been published and merely await the necessary legislation being passed by Parliament for their confirmation.

"These terms, whilst being satisfactory from the point of view of the manufacturer in Great Britain, must be the source of considerable disappointment to British firms in China to whom large sums of money have been owing for years for supplies to the various Chinese railways.

"Not only is no provision made for the payment of these debts but the Purchasing Commission which will have the task of placing orders in Great Britain for the requirements of the various railways in China will naturally purchase direct from manufacturers so that British engineering firms in China, to whom large sums are owed, will have no opportunity in participating in this business. In view of the fact that it is the British firms in China who have been for many years past carrying the burden, and not the manufacturer in Great Britain, it might have been expected that under the terms of the Agreement for the disposal of the Boxer Indemnity, the Purchasing Commission would have been set up in China and a stipulation made that all purchases would be subject to public tender in China.

"The decline of British trade in China is largely due to two causes, namely; the high cost of British material and the fact that the strength of the British merchant in China is being gradually exhausted. It is he who has been the distributor in China for British manufactures. The British manufacturer has received his money on delivery of the goods in Great Britain, whereas the British merchant in China, who has been encouraged to build up

organizations in the interior for the distribution of these same goods, has for some years past, owing to the disturbed conditions of this country, seen his properties looted, his goods stolen and his customers in the interior ruined, as a result of brigandage, etc.

"Credit conditions in this country are such that the British manufacturer cannot with safety deal direct with the native consumer and is therefore largely dependent on the British merchant in China as an intermediary.

"The gradual exhaustion of the British merchant in China should be viewed with alarm by the manufacturer in Great Britain and this is a point which may well be brought to the notice of the Economic Commission which is now on its way to the East. How little the British Government considers the welfare of the British merchant in China as compared with that of the manufacturer in Great Britain is illustrated by the manner in which the Boxer Indemnity Agreement ignores the interests of British engineering firms in China."

America's Caribbean Doctrine and Japan's China Policy

It is interesting to learn that Dr. George H. Blakeslee, Professor of International Relations at Clark University, who leads the Far Eastern Round Table of the Williamstown Institute of Politics, endorses the arguments advanced by the Publisher of *The Far Eastern Review* at the 1927 session of that Institute in comparing the Caribbean policy of the United States with the Manchurian policy of Japan.

"Both countries," says Dr. Blakeslee, "hold territories by lease in foreign lands which they regard as vital to their respective national interests. Japan holds in Manchuria (admittedly a part of China) the Liaotung Peninsula by lease and the South Manchuria Railway by concession; while the United States holds the Panama Canal Zone, the Panama Canal and Railway by lease in a Caribbean country. Both the United States and Japan would defend their respective leaseholds at almost any cost."

Just so. If the United States is justified in applying a doctrine for the defense of its vital strategic and economic interests in the Caribbean, based on its possession of a leased strip of land passing through the territory of another country, Japan is still more justified in holding on to her 99 year concession to the South Manchuria Railway and Liaotung lease as being absolutely essential for the defense of her vital economic and strategic interests.

The only possible menace to the existence of Japan comes from "the direction of Urga," across territory that belongs to China and which the Chinese are as yet too weak to defend. A nation that cannot guarantee or protect its neutrality and discharge its international obligations, must inevitably suffer an infringement of its sovereignty by the stronger nation whose existence is placed in jeopardy by its weakness or inefficiency. Japan, as the stronger power, has simply followed the precedent created by Great Britain in Gibraltar, Egypt and Hongkong and later by the United States in Panama, in leasing strategic positions that if left to the weaker nation to guard would imperil their arteries of communications and invite disaster.

Philipp Marshall Brown, professor of international law at Princeton, disagrees with this similarity in the policies of the United States and Japan, contending that the American policy has been based on a desire to promote peace and secure safety of the Panama Canal, while Japanese intervention in Manchuria has been nationalistic. Professor Brown apparently, is not thoroughly posted on the significance of the Li-Lobanoff secret treaty of alliance of 1896, nor has he carefully read the "Memoirs of Count Witte," or he would have to admit that Japan's policy has been a defensive one, forced upon her by the warlike activities of Russia after Portsmouth and the venality and ineptitude of Chinese officials. Japan's presence in Manchuria carries no more menace to China than Britain's permanence in Kowloon, but until China is strong enough to defend her neutrality in Manchuria and discharge her obligations to Japan, it would be as suicidal for the latter to surrender her present strategic guarantees of national security as it would be for the United States to dismantle its forts and retire its armed forces from the Canal Zone.

Japan's Right to Exist

(Continued from page 533).

Asia and Mongolia to seek their livelihood. If they turn to industrialism in order to exist, our Western system will suffer in the competition.

The picture is not overdrawn. For the moment, Japan's critical situation demands immediate attention, as upon an equitable adjustment of her problems, may depend the fate of Civilization. If we are to continue to bottle up this virile, hard-working industrial people in the confines of their own limited habitat and ignore their reasonable appeals for readjustment of world tariffs that will enable them to develop and exist peacefully, there can be no lasting peace in the world.

The Governments of the world are preparing for war on a grander scale than ever before. There are more causes for an outbreak than existed in 1914. The Governments officially acknowledge the supreme claims of Peace and have unanimously repudiated war as an instrument of national policy. Nevertheless, preparation for war continues. The Franco-Italian hostility does not differ in essentials with the earlier tension between France and Germany; the clamor of a rapidly multiplying people for a place in the sun for colonies in nearby Africa, now held by France as conscripting grounds for negro troops to reinforce her own diminished man-power. There are many other repressed forces at work in the thirty odd conflicting nationalities that now exist side by side in the restricted confines of continental Europe, any one of which may blow the lid off overnight and usher in another world catastrophe.

Many of these underlying causes of war are duplicated here in the Far East. Many of the most violent are intensified. Japan, a nation of ninety millions, the third great naval power, has been brought face to face with a crisis in her national life. She stands at the cross roads and halting there, places her case before the world confident that the desire and will to peace, will be answered in the same spirit of friendly consideration.

Japan's peaceful existence depends upon a revolution or at least a readjustment in the present nationalistic viewpoint towards tariffs and monopolization of raw materials. The Governments of the world have renounced war in its military conception as an instrument of national policy, but war to the death continues, waged behind high protective tariff walls, investments, control of industries, shipping and basic raw materials. The nation not endowed by nature with self-sufficing resources, is as vulnerable and open to aggression from stronger financial and industrial powers as the state deficient in military preparedness. It makes little difference whether a people are killed off by gun-fire, poison gas, bombs or any other fiendish invention for wholesale slaughter, or slowly starved to death by a trade, financial or industrial blockade which accomplishes the same purpose.

The first step towards ushering in a new era of world peace should be some agreement for the internationalization of raw materials. The tariff mania must be curbed, providing for freer trade and fairer access to markets. Economic imperialism would be discouraged by the refusal of governments to put armed force behind private investors abroad.

A start must be made and without delay. Another few years and it will be too late.

Japan is rapidly exhausting every feasible and peaceful method of solving her problems, Industrialization, scientific development of agriculture, production of synthetic foods and even birth control cannot stop the natural increase of her population. With their backs against the wall, struggling heroically in a losing fight to preserve their existence, Japan appeals to the other Powers for justice. Equal Opportunity, an Open Door for World Trade and the Investment of Surplus Capital must follow the London Naval Treaty and the Kellogg Pact if permanent peace is to be realized. There can be no peace without justice.—G.B.R.

The L. E. Gale Company has completed a contract with General Chang Mo-hsiang, representative of Honan Province, for the purchase of six military airplanes, two Vought Corsairs, with full military equipment, and four Fairchild light military airplanes powered with a 165 Wright motor. Delivery of airplanes and parts is to be made within ninety days. The total amount of this order is for U.S. \$110,000. This makes fourteen airplanes which have been sold by the Aviation Division of The L. E. Gale Company during the past four months.

Far Eastern Waterworks—II

Kobe Municipal Waterworks Extension Program

By EISABURO KUSANO

A Y.10,000,000 extension project of the Municipal waterworks of Kobe, Japan's foremost international harbor city, is nearing completion. The project consists of the heightening of Senkari reservoir dam by 20 feet to 140 feet thereby increasing the raw water holding capacity from 213,000,000 cubic feet to 417,000,000 cubic feet, of building new water way including tunnels and box culverts, of constructing new clean water reservoirs here and there, of extension of existing waterworks, of establishment of new rapid filter system, and extension of distribution mains.

Upon completion, the volume of water supply per family per diem will be increased from 25 cubic feet to 27 cubic feet on the average, and that of the maximum supply, from 35 cubic feet to 38

Under the circumstances, a waterworks is of dire necessity for a city like Kobe especially when it grows bigger and prosperous with the subsequent rapid increase of the population. And, to make the matter more difficult, the city must obtain water from far away rivers as it does.

The city has blocked rivers at Nunobiki and Karasuhara to create water sources, and later it has also blocked more rivers at Senkari to convert a spacious ground into one gigantic pond. The water way from Senkari to the city section extends to 25 miles, it crossing rivers and running through hills by tunnels. The water is led all the way by the natural flow of water, with the theory of cyphon applied here and there at its best advantage when crossing rivers underneath their beds.



Kobe Municipal Waterworks: The Senkari Dam Under Reconstruction. The dam has been Heightened from 20 to 140 feet, thereby Increasing the Capacity of the Reservoir from 200,000,000 cubic feet to 400,000,000 cubic feet

cubic feet. The number of families to be furnished with water is also to be increased from 100,000 to 160,000.

The existing system was originally established in 1900, and it has been extended for a number of times since, always necessitated by the rapid development of the city, until the present extension work was started on May 1, 1926, following the Government approval of the project in December, 1925.

Kobe is a narrow city extending from east to west at the foot of the Rokko mountain chain. There are such short rivers as the Ikuta-gawa, the Uji-gawa, and Minato-gawa, but they are practically dry during most part of the year, and yet, once it rains, turbid water runs down in torrent. The underground water vein, on the other hand, offers no better source of water in this city, particularly in the sea coast district. In the northern elevated parts of the city, the condition is better, but then, the quantity is small, and the quality, too, cannot be called perfectly satisfactory.

Another feature of the Kobe waterworks is that it operates both the rapid filter system and the ordinary slow affair at the same time to regulate its service.

Outline of Development

It was as early as in 1873 that the need of waterworks in Kobe came to be advocated for the first time. Presumably as a result of this public demand, the local prefectural authorities promulgated regulations governing drinking water in September, 1878. These regulations were then improved for a number of times later.

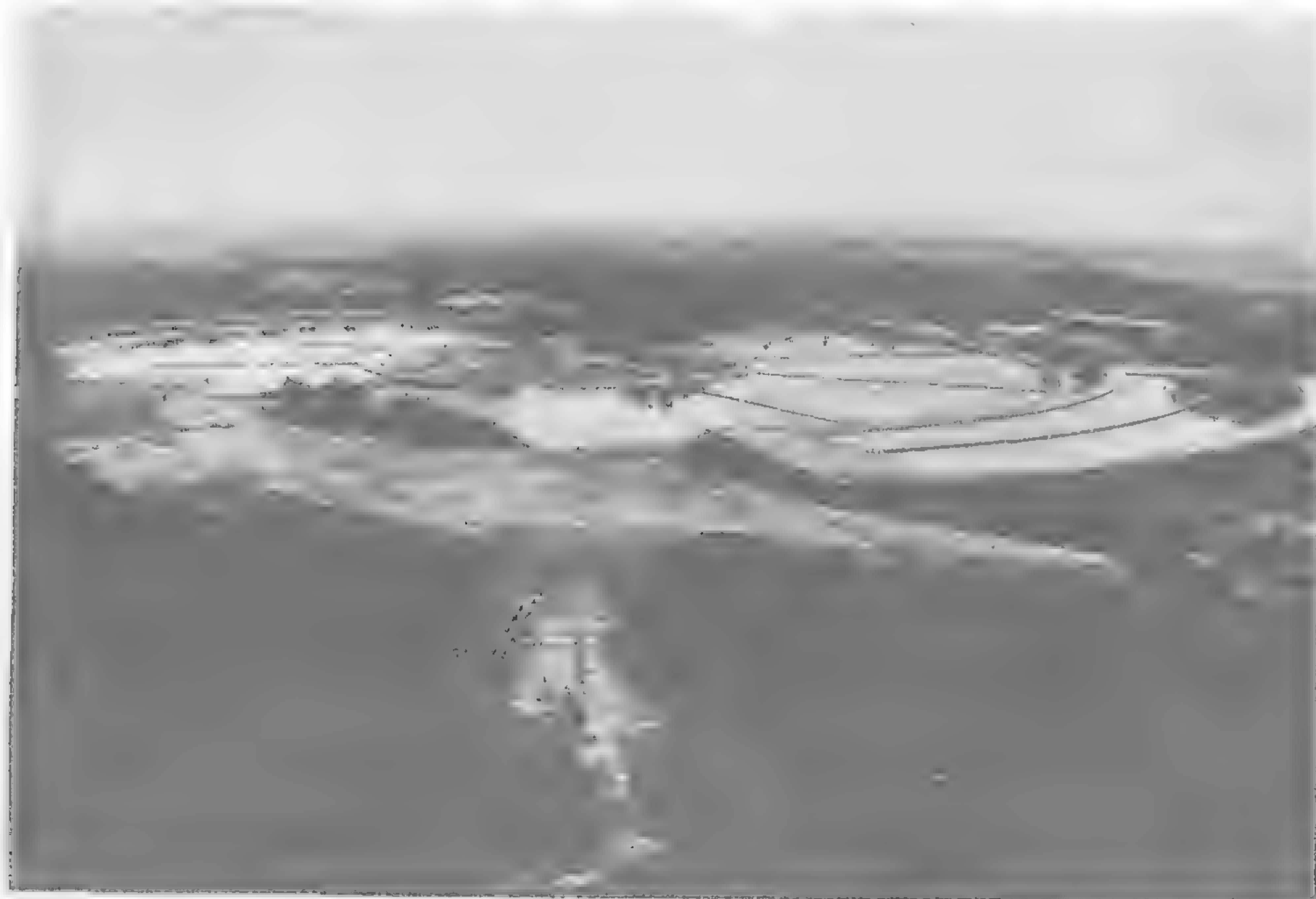
In 1882, the prefectural authorities conducted an extensive investigation of the quality of water of wells in Kobe city and found that it was in a deplorable condition due to the fact of refuse accumulating and sewage system not functioning properly, and these undesirable elements gradually penetrating into the ground,



After an Exceedingly Long Drought Some Years Ago, When all the Rivers and Wells Dried Up, the Great Senkari Reservoir Showed its Bottom



Takedao No. 1 Water-Main Bridge, Showing the 45-in. Main alongside the Old 33-in. Main



General View of the Uegahara Waterworks. The Square Buildings Seen on the Right are the Rapid Filter System, and the Round Building in the Center is an Old Mixing Chamber



Service Mains of the Uegahara Waterworks in the Course of Laying

thereby impairing the quality of the water. The prefectural authorities, therefore, improved the sewage system in order to dispose of sewage efficiently. Contrary to their expectations, however, they were unable to obtain the desired result from this step, as the improved sewage system carried away the rain water so quickly that it had hardly time to seep into the earth, and it eventually induced salty seawater to permeate into the ground. The water of wells in the seacoast district became salty as the result.

In view of the fact that plans were under way in Yokohama in those days of constructing a waterworks, similar plans then came to be advocated in this city again, but they did not materialize.

Kobe became a city in April, 1889, and the Municipal Assembly was organized subsequently. At its session in July of the following year, a proposal was made that Kobe should have a waterworks, and the matter was referred to a committee of ten who started to work immediately on the project. In September, 1891, the Kobe waterworks investigation committee was organized and an English engineer, Mr. W. K. Bolton, adviser to the Department of Home Affairs in those days, was asked to draft the plan which was completed at the end of the following year. Meanwhile the committee-men inspected the waterworks that were already operated in various other cities in Japan.

The plan of building a waterworks in Kobe was thus prepared and it was approved by the Municipal Assembly in July, 1893. According to this plan, the Kobe waterworks was to obtain water from rivers of Nunobiki and Futatabi to supply a population of 150,000. The estimated cost of construction was Y.970,000. The plan also provided that the city should obtain a subsidy from the Government to the amount of Y.300,000, and that the rest be met by issuing bonds. The city applied to the Government for the license to build a waterworks and also for the subsidy.

The 5th and the 6th sessions of the Imperial Diet, however, were dissolved. The Sino-Japanese War broke out in the meantime, and it was in March, 1896, that the application for the Government subsidy to the Kobe waterworks was finally approved by the Diet. It was decided then that the subsidy be given annually for five years, to the amount of Y.60,000 each year. Simultaneously, it was approved that Kobe may start the construction of the waterworks.

Because of the fact that three years had elapsed before Kobe's application was approved by the Government, it was found then that the original plan was rendered inadequate; the city had outgrown the plan. Consequently, a waterworks office was opened in July, 1896, to prepare for the commencement of the work and also to carry out another extensive investigation with an eye to a further enlargement of the plan.

The new plan was drafted in May, 1897; it proposed to supply a population of 250,000 and the estimated cost of construction, too, was increased to Y.3,290,000 which represented an increase of Y.2,140,000. The Government subsidy was to be increased by Y.680,000.

Of the total estimated cost of construction amounting to Y.3,290,000, up to Y.2,911,000 was to be raised by issuing bonds, Y.140,000 was to be disbursed by the city, and the remainder of Y.240,000 was to be met by the Government subsidy to be granted during the four years ending in 1899, at the rate of Y.60,000 a year in accordance with the original five year plan. The remaining Government subsidy of Y.60,000 to be granted in 1900 (the 5th year of the five-year plan) and also the new subsidy of Y.680,000 to be granted during six years in and after 1901 was to be used for redeeming the bonds. This extension plan was approved by the Government, and the subsidy, too, was approved by the Diet in March, 1899.

Meanwhile, the actual work of construction of the Kobe waterworks was commenced in May, 1897, in accordance with the original plan, and the first Kobe Waterworks was completed after three years' time. The supplying of water was subsequently started on April 1, 1900. The extension work, too, was completed in May, 1905.

The Kobe waterworks in those days, however, was constructed on the basis of supplying 3 cubic feet of water per head per diem to the total of a population of 250,000. The actual quantity of water supplied, however, amounted to about 5 cubic feet per head a day, and besides the population went on increasing rapidly. In the summer of 1906, the demand already exceeded the capacity of the Kobe waterworks, and the city authorities had to exercise some restrictions on the water supply. It soon became necessary

therefore to extend the waterworks again, but it was also necessary this time to find a new water source as there was little room of obtaining more water from the then existing sources.

Several years' intensive investigations resulted in the drafting of a Y.11,995,000 plan to extend the Kobe waterworks during eight years beginning in 1910. The plan was introduced in the session of the Municipal Assembly to October, 1909, and it was approved in December of the same year.

In January of the following year, the city applied to the Government for its approval of this plan. The plan, however, was rejected on the ground that some alterations were found necessary especially in connection with the Government subsidy. The city effected the necessary changes and applied to the Government for the second time and received the approval in May, 1911. This new plan provided that the extension work be completed in the course of 12 years at a cost of Y.12,314,000. The plan, however, was found to be too slow in progress to meet the pressing state of affairs in those days. Consequently, a third plan was drafted and was submitted to the Government. The Government however, had decided to give its subsidy of Y.2,423,000 during 12 years, and therefore, the third plan had to be altered again. The revised plan was submitted to the Government in April, 1912, and it was approved in July of the same year.

Meanwhile the extension work had been going on in accordance with the second 12-year plan which the Government had already approved. The continuous development of the city and also the rise in the price of commodities made it necessary that additional budget be appropriated even after the last revised plan was put into practice. But the entire work was completed in 1920 to the satisfaction of all parties concerned.

Present Extension Work

The present extension work was commenced on May 1, 1926. It has practically all been completed, and the Kobe Municipal authorities now concentrate their efforts entirely on the last stage of the project—the construction of the Nada clean water reservoir.

The extension of the Senkari raw water reservoir constitute one of the most important parts of the whole scheme. Its dam has been elevated by 20 feet to 140 feet, the length extending to 352 feet, and as the result, the capacity of holding raw water has been increased from 213,000,000 cubic feet to 417,000,000 cubic feet. In sequence to this extension work, the embankment of the surplus water outlet, too, has been elevated from 17 to 37 feet for a distance of 350 feet. Two volume-measurement devices have been set up in the upper stream of rivers emptying into the reservoir, and a new road was built for a distance of nearly 9,000 feet.

In the old system, the water of the Senkari reservoir was led by a tunnel as far as Namaze, thence to the Uegahara waterworks by a 30-in. cast iron main, but a new waterway has been constructed by the tunnel system all the way from Senkari to Uegahara in parallel with the old system. (They are both in use.) When crossing rivers, however, cast iron water main is used, either by spanning across the river like a bridge or syphoned underneath the river-beds.

In laying the new water way, the bridge system was adopted at the Takedao No. 1 and No. 2 water main bridges and at the Namaze No. 3 water main bridge of the old system; the first two bridges have cast iron tubes of which the inside diameter is 45 inches each, and the last mentioned bridge has a 30-inch tube. All the rest of the rivers between Senkari and Uegahara are crossed going underneath their respective river-beds.

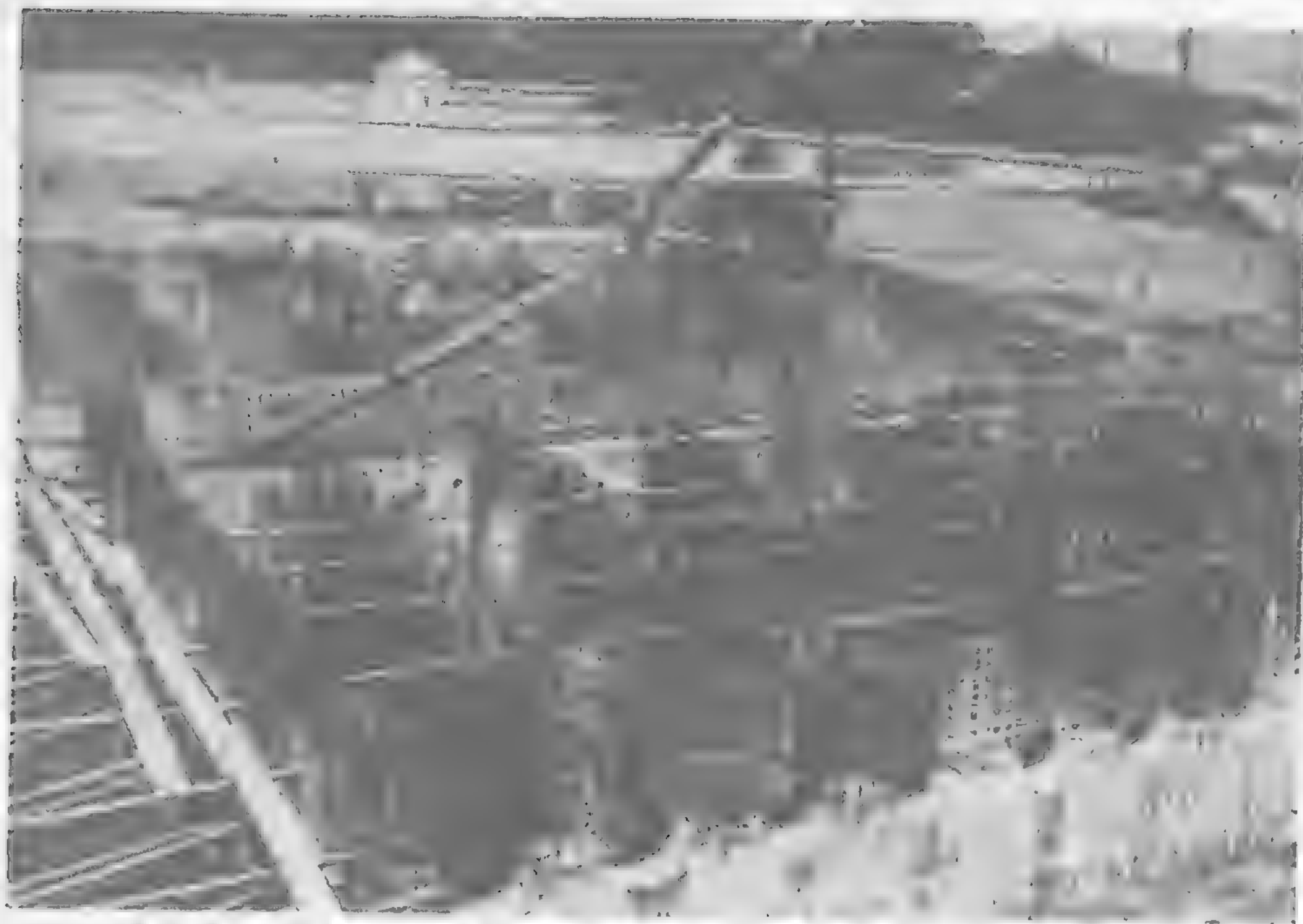
The tunnel water way is an inverted horse-shoe-shaped culvert the height of which is 6.05 feet, and width, 5.45 feet, its length extending to 16,195 feet.

As the result of this extension of the water way, the capacity of leading water has been extended from 20 cubic feet to 72 cubic feet per second, which assures the city not to suffer from the shortage of water supply for quite some time to come.

Uegahara Waterworks

This is the station where the raw water that comes from Senkari is cleansed and further pumped on to other stations after it is cleansed, to be distributed to the ultimate consumer. It used to cleanse water in an ordinary slow process to cover 64,000 families at the rate of 25 cubic feet on the average per family per diem,

KOBE MUNICIPAL WATERWORKS



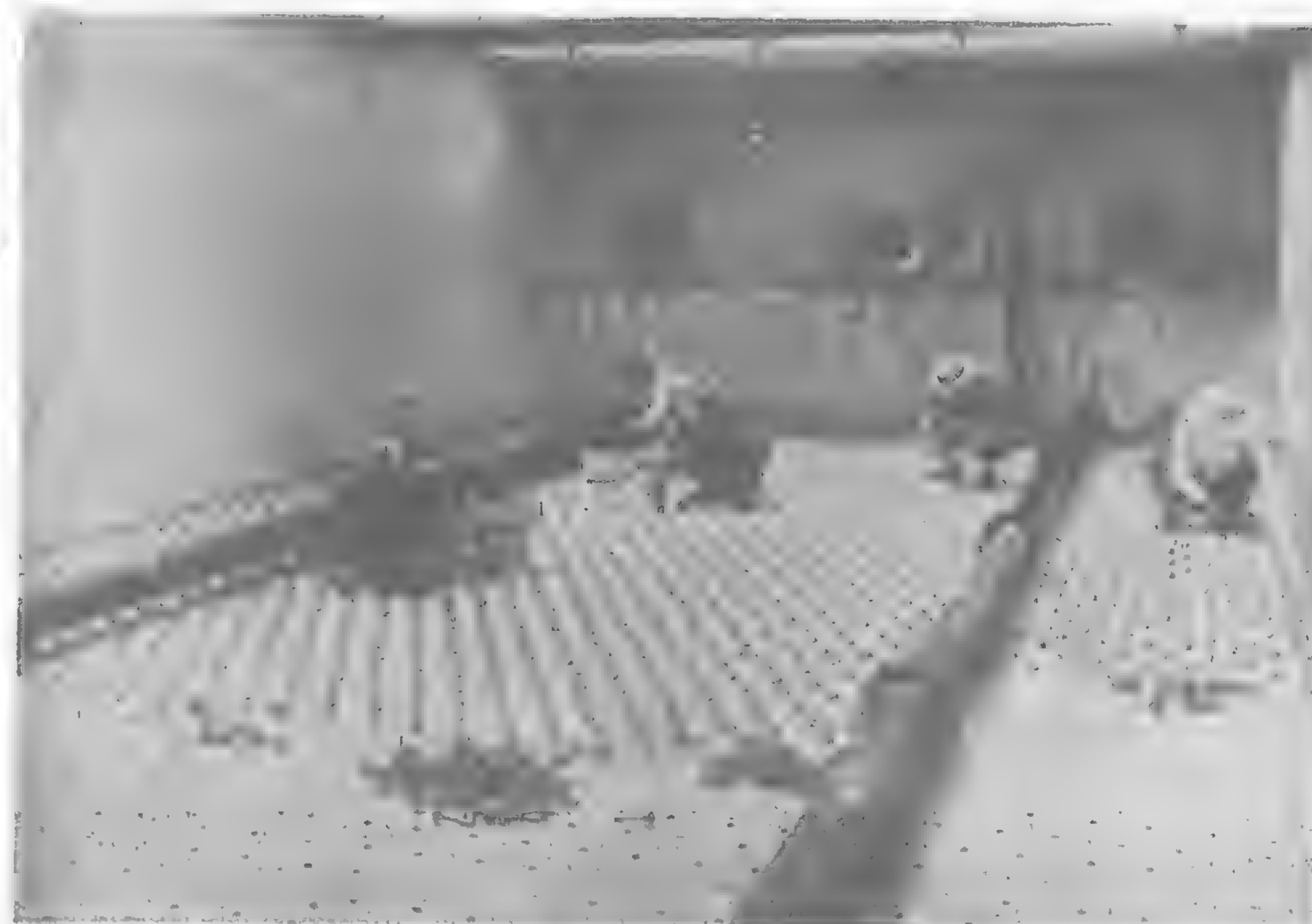
Rapid Filter System of the Uegahara Waterworks Under Construction



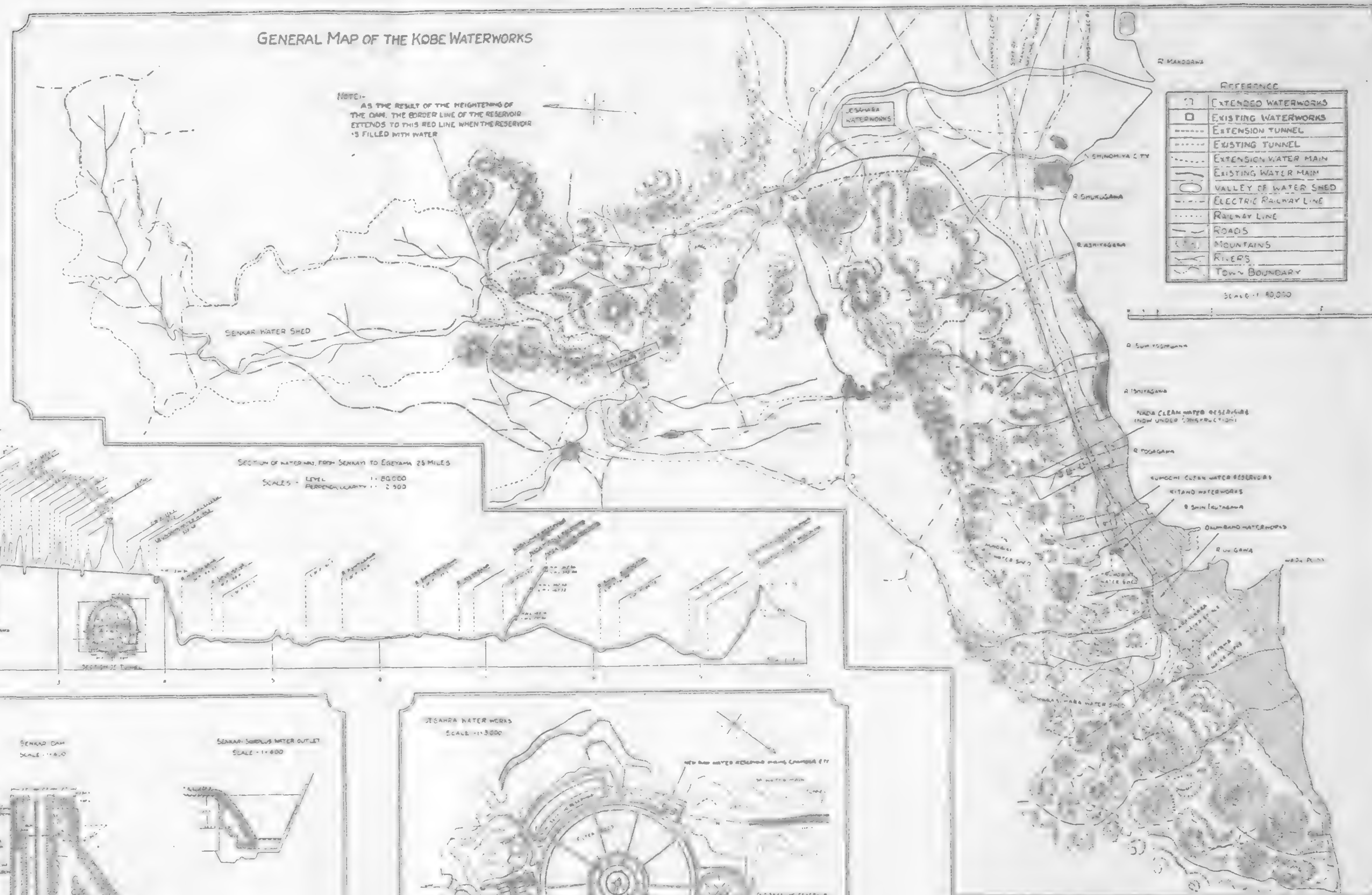
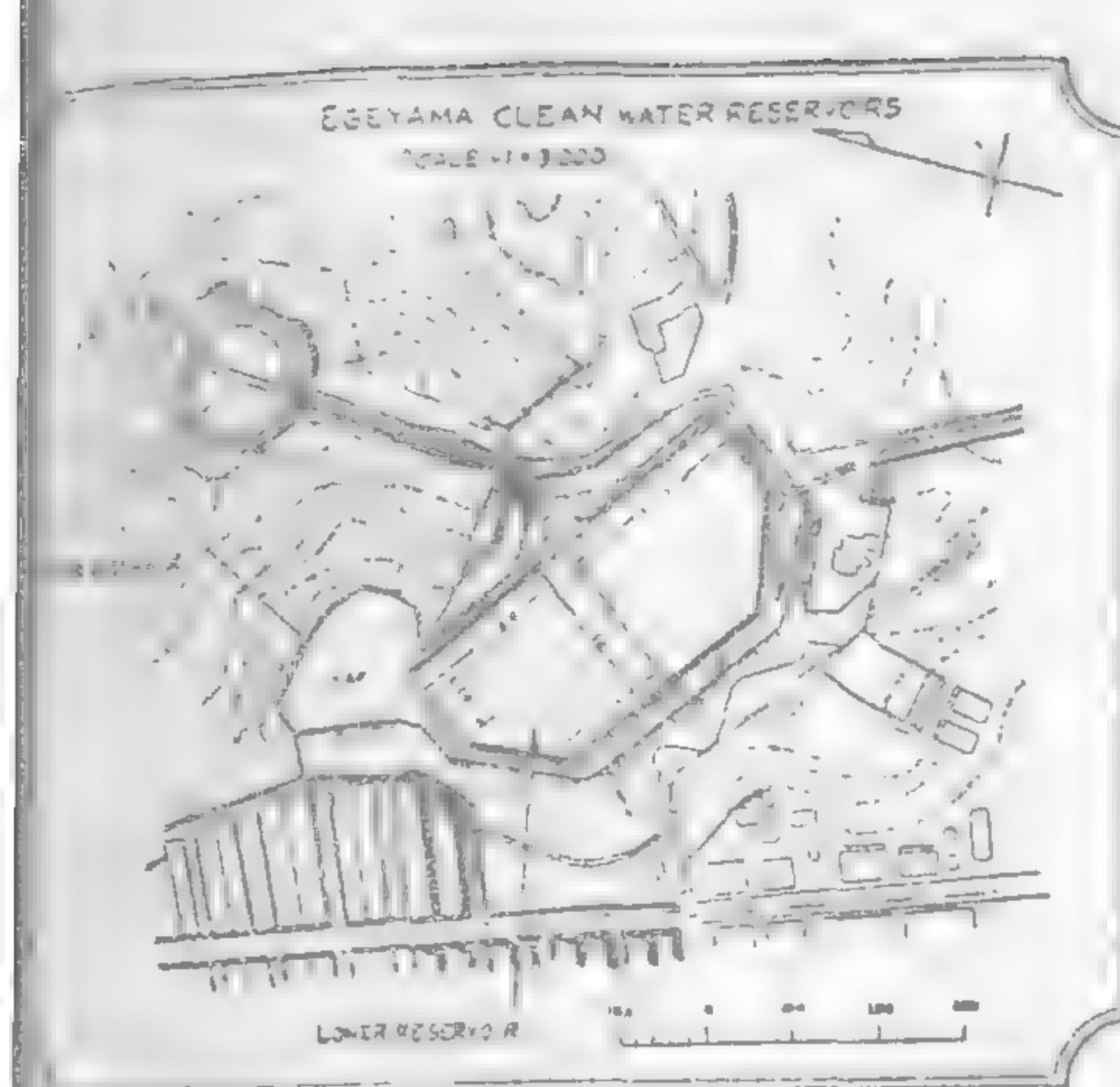
Inside View of the Rapid Filter System of the Uegahara Waterworks



Bottom of Rapid Filter System of Uegahara Waterworks (a)



Bottom of Rapid Filter System of the Uegahara Waterworks, (b): Note, the Surface is Coated



GENERAL MAP OF KOBE MUNICIPAL WATERWORKS

The City of Kobe having no natural water sources in its neighborhood, has dammed the rivers in the hills back of the city creating reservoirs at Nunobiki and Futatabi. The city soon outgrew this supply, and by damming various other rivers, converted an extensive area into the new Senkari Reservoir which holds 213,000,000 cubic feet of water. Needing more water, the Senkari dam was raised from 20 feet to 140 feet, increasing the holding capacity of the reservoir to 417,000,000 cubic feet. In connection with this extension, riverbeds have been cleaned; the waterworks system has been extended, several subsidiary reservoirs constructed, and more distribution mains have been laid, in accordance with the Y.10,000,000 extension program now nearing completion.

but as the result of the present extension work, which included the construction of a rapid filter system, the capacity has been enlarged to such an extent that it can now take care of 68,000 families at the rate of 27.5 cubic feet on the average per family a day.

Upon arrival at the Uegahara waterworks from Senkari, the raw water is led into the raw water reservoir which is connected with the measurement device, medical mixing chamber, and the power generating plant which is operated by use of the water that runs the water way. The hydro-electric power thus generated is used in operation of the rapid filter system.

The raw water reservoir has a measurement of 49.1 feet by 12 feet, with a depth of 10 feet. There is a shed on the top of this reservoir wherein installed are the power plant and alumina mixing device. The capacity of the power plant is 18.4 kw.

The new settling reservoir is fan-shaped, it lying just beyond the outer rim of the old filter beds. Its size is 390 feet long by 100 feet wide, and it can contain a quantity of water which can last 4.5 hours with the whole works being operated at the maximum speed.

The rapid filter beds consist of two rows of four rectangular ponds; each one of them measure 20 feet wide by 45 feet long with a depth of 11.5 feet. There is a shed on the top of these ponds running along the centre, used for various purposes. The daily filtering capacity of this filter system is 2,360,900 cubic feet. Just underneath the rapid filter beds there are two regulation reservoirs where cleansed water is held temporarily. Each one of them measures 46 feet wide by 83 feet long with a depth of 13.5 feet.

There is a tank just beside the rapid filter bed; it is 41 feet higher than the surface of the water in the rapid filter bed. This tank is for the purpose of holding water with which to clean the rapid filter beds from time to time by means of water pressure. The inside diameter of this tank is 28 feet, the depth is 15 feet, the effective capacity being 6,000 cubic feet. This tank is connected with two 15 h.p. centrifugal type pumps, which are driven electrically.

There are also four compressed air chambers made of steel, each one of them having a measurement of 7.6 feet for the inside diameter with a height of 17 feet, the aggregate total capacity amounting to 3,000 cubic feet. The air pressure is 20 lbs. within the chamber, but this is reduced to 4 lbs. when it is used in cleaning the rapid filter beds—before the compressed water is used for the same purpose. These compressed air chambers are connected with two 15 h.p. rotary type pumps which are also electrically driven. There is a motor to operate these four pumps, and there also is a heavy oil engine as a reserve.

The cleansed water reservoir is 10 feet by 15 feet, with a depth of 20 feet and at the outlet there is an automatic bulb. At the starting point of the distribution main, there is a measurement device in order to record the volume of water outflowing.

From Uegahara waterworks to the Okuhirano cleansed water reservoir, the cleansed water was sent by a 33-inch forwarding main but as the new clean water reservoirs have been established at Egeyama, a new 36-inch forwarding main has been laid, it extending to a little more than 70,000 feet. The old and new water mains are in use at the same time. This new water main is connected with the old 33 inch main at a number of points by means of connecting tubes.

There are four kinds of cast iron mains in use, i.e., low pressure, ordinary, high, and extra-high pressure mains. The connection of the high and extra-high pressure tube is made by a special device.

The water forwarding capacity of the Uegahara waterworks used to be 20 cubic feet per second but it has been increased to 40 cubic feet as the result of the laying of this new water main.

Egeyama Clean Water Reservoirs

There used to be three clean water reservoirs within Kobe city, at Kumochi, Kitano, and Oku-hirano, but two more clean water reservoirs are to be added as the result of the present extension plan. The one is the Egeyama station and the other is the Nada station.

The Egeyama clean water reservoir station, which is to take care of the western parts of the city, is made up of two reservoirs, one of them having been constructed on a higher location. From the Uegahara waterworks, a certain quantity of water is sent to these reservoirs evenly, and the fluctuation of the demand is to

be regulated at the Okuhirano waterworks with the water led from Karasuhara source.

The lower clean water reservoir of the Egeyama station is 213 feet long by 193 feet wide, with an effective depth of 10 feet, the total capacity amounting to 720,000 cubic feet. There is a pump room where there are two turbine type 110 h.p. pumps. Only one of them is used, the other being reserved for emergency purposes. The room, however, has space enough to install two more pumps. These pumps are for the purpose of sending up water from the lower to the higher reservoir.

The higher reservoir is made in the shape of a cylinder with an inside diameter of 126 feet and effective depth of 12 feet, the total capacity amounting to 115,500 cubic feet.

Nada Clean Water Reservoirs

The Nada clean water reservoirs are now under construction, these being the last part of the present extension program to be finished. They are being constructed to take care of the newly annexed portions of the city in the north-eastern district. It will have three clean water reservoirs, the lower, middle, and higher reservoirs. The aggregate total capacity of these three reservoirs is expected to supply 35,000 families.

Nevertheless, it will have distribution mains sufficient to take care of only 16,000 families for the time being, and more distribution tubes will be laid when the local population increases in the future. This station will be fed with water from the Senkari source via Uegahara waterworks for the time being until it becomes necessary to operate on its own supply.

The lower reservoir consists of two ponds, each one of them measuring 90 square feet with an effective depth of 17 feet, the total capacity amounting to 257,000 cubic feet. The cleansed water from the Uegahara waterworks runs into this reservoir by the natural flow of the water. There is a pump room connected with this reservoir in the neighborhood of the entrance. There are two pumps and 60 h.p. motors installed in this pump house for the purpose of sending up the water from this reservoir to the middle; there are two more pumps and two more 60 h.p. motors which are for the purpose of sending up the water from this reservoir to the higher reservoir. The middle reservoir consists of two ponds, the size of each being 76 square feet, with an effective depth of 17 feet, the total capacity amounting to 192,500 cubic feet. The higher reservoir is made up of two semi-circular ponds, each one of them having a radius of 46 feet with an effective depth of 17 feet, the total capacity amounting to 112,300 cubic feet.

Over-Population: Japan's Basic Problem

(Continued from page 535).

building higher and higher tariff walls against the importation of foreign goods and closing their doors against foreign capital and labor. In this age of international political harmony, all economic troubles should be discussed and solved at round table conferences.

Based upon this presentation of self evident facts, I feel justified in proposing the following principles upon which a real and permanent world peace can be firmly established:

- (a) Rational division of population all over the world.
- (b) Rational movement of industrial products all over the world.
- (c) Rational movement of foodstuffs and raw materials all over the world.
- (d) Rational movement of capital all over the world.

In short, we advocate, the adoption of the principle of equal economic opportunity, an Open Door for commerce all over the world. We firmly believe that the acceptance of such a Doctrine by the Powers will automatically make the world a safer place to live in and do more towards ushering in an era of permanent peace, mutual understanding and cordial relations than any limitation of armaments designed for the same purpose.

In view of the momentous nature of these issues, involving world distribution of "men," "materials" and "capital" members of the Rotary International, a gathering of peace-lovers, should give earnest attention, thought and study to these problems and contribute their share towards any solution that will advance the cause of world peace and humanity.

Automatic Telephones in Japan

By S. INADA, Director General of Telegraph and Telephone Engineering, Department of Communications

THE semi-tropical climate was a serious problem for the adoption of the automatic switching system in Japan. After thorough investigation a P.A.X. equipment was installed in the Communication Department in October 1922. It was a Strowger automatic switching equipment manufactured by Automatic Telephone Manufacturing Co., and equipped for 300 lines with Keith line switches. In April 1, 1923, the first public automatic exchange was opened at Dairen, South Manchuria, for 5,800 lines (ultimate capacity is for 10,000 lines) with the same manufacturers' equipment using rotary line switches. From the experience gained in Dairen, it was intended as a guide to adopt the automatic switching system in Japan. Eventually, by the great earthquake in September of 1923 the most of the telephone plants in Tokyo and Yokohama were destroyed. For its reconstruction we decided to adopt the "step-by-step" automatic switching equipment with the exception of four manual exchanges in Tokyo because of the necessity of rapid recovery. Kyobashi office, the first automatic exchange in Tokyo was opened in January 1926, with 3,000 lines. Other exchanges were opened one by one in Tokyo within one and a half years, until by July, 1927, the tenth automatic exchange at "Shiba" was opened.

At that time the total number of automatic subscriber lines in Tokyo were 36,000 out of a total of 86,000. After that, the automatic switching systems were adopted in many other cities.

At the end of March 1929, the total equipped line terminals were 102,100 and the actual automatic subscriber lines 84,517 which corresponds to 12.7 per cent. of the total number of subscriber lines of the whole country. The details are shown in Table 1. Many private branch exchanges are also automatized. At the end of March 1929, the number of P.A.X. was 160, and the equipped number of lines was 12,182.

For the future development of telephone plants in large cities and also even in other smaller cities, the automatic switching equipment will be adopted if the circumstances are favorable.

The automatic equipment were hitherto supplied from abroad, but recently the home manufactured apparatus has become available.

The general engineering principles of automatizing are described in the following.

Numbering

(a) *Office Number.* There are at present in Tokyo 11 automatic and nine manual exchanges. The Tokyo telephone area is divided into seven districts. Two digits were assigned to each office, the first figure being for district code and the second figure for office code. Districts are numbered from two to eight, nine being reserved for future. All exchanges are designed for 10,000 line capacity and have no branch office.



The New Kanda Automatic Telephone Exchange, Tokyo



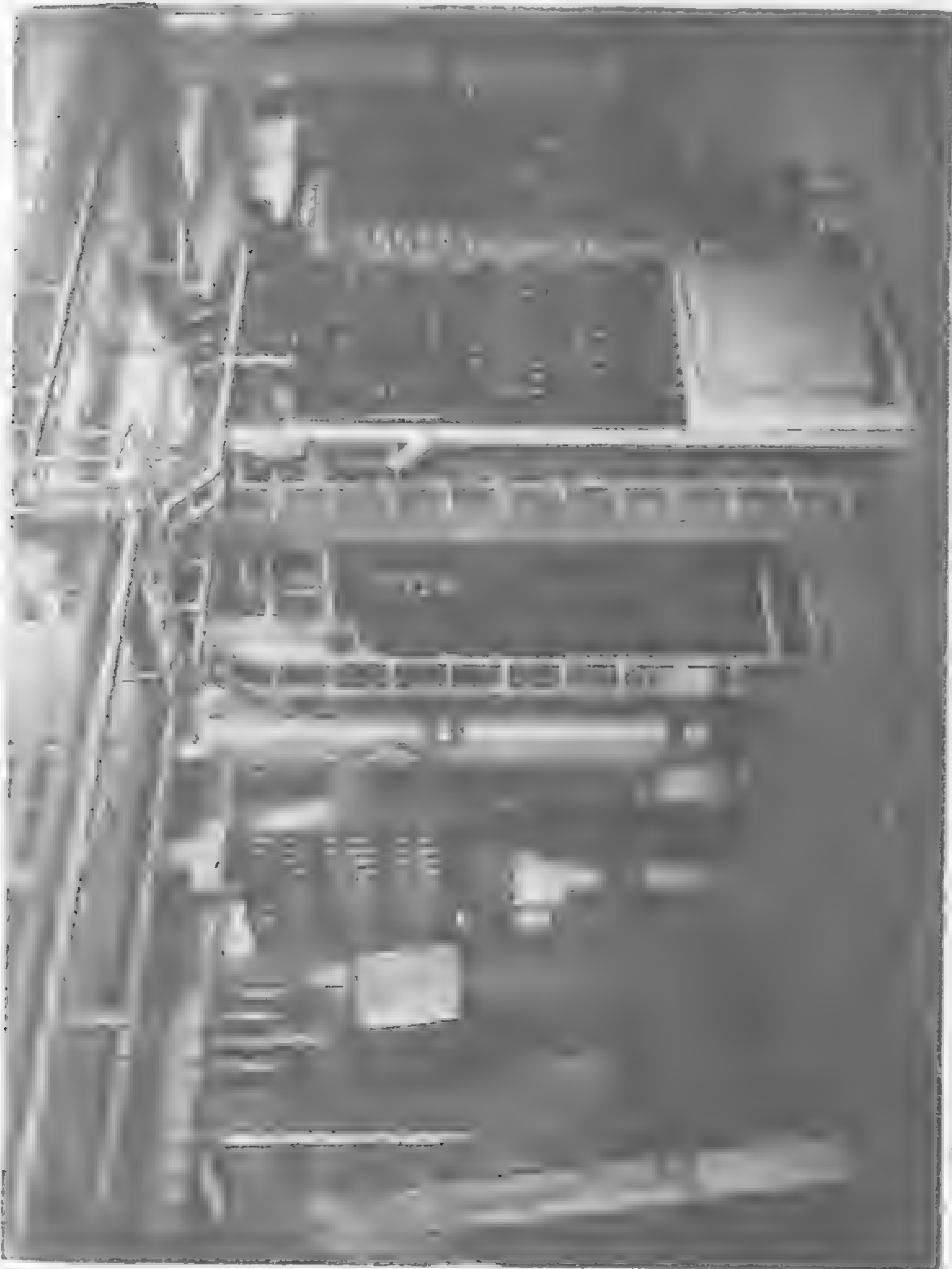
Interior of New Kyobashi Automatic Telephone Exchange, Tokyo
Service Meters



Storage Batteries

KYOBASHI AUTOMATIC TELEPHONE EXCHANGE, TOKYO

Equipped with the Strowger System



Fuse and Alarm Boards



Wire Chief Desks



Motor Generators



Terminal Room



Honjo Automatic Telephone Exchange, Tokyo: Selectors

TABLE I.—NUMBER OF AUTOMATIC SUBSCRIBERS ACCORDING TO THEIR LOCATIONS AND TYPES OF EQUIPMENTS IN 1928.

Name of Cities	Type of Equipment	Office Name	Equipped No. of Lines at the end of 1928	No. of Subs. Lines actually equipped at the end of 1928	Opened at the year of	Name of Manufacturer
Tokyo	6 digits with Strowger type	Kyobashi	7,300	6,017	1925	A. T. M.
"	"	Honjo	6,400	5,643	"	"
"	"	Shitaya	7,700	6,850	"	"
"	"	Kanda	4,200	3,061	"	"
"	"	Kayabacho	3,400	2,346	"	"
"	"	Kudan	3,600	3,300	1926	"
"	"	Otsuka	2,900	2,627	"	A. E. I.
"	"	Marunouchi	4,100	3,641	1927	"
"	"	Nihonbashi	4,000	3,136	"	"
"	"	Shiba	4,000	2,671	"	"
"	"	Mita	—	842	1928	"
"	"	Asakusa	8,000	—	in instal-	"
"	"	Akasaka	2,000	—	"	"
Nagoya	5 digits with Strowger type	Honkyoku	5,000	2,719	1928	"
"	"	Naka	4,000	2,756	"	"
Kyoto	"	Honkyoku	7,000	5,123	"	"
"	"	Gion	4,800	3,618	"	"
Near Tokyo	4 digits with Strowger type	Nakano	2,800	—	in instal-	Nippon Electric Co.
"	"	Kawasaki	1,800	—	"	A. E. I.
"	"	Ebara	1,600	—	"	"
"	"	Senju	1,400	—	"	"
Yokohama	5 digits with Strowger type	Honkyoku	6,000	5,149	1925	S. H.
"	"	Chojamachi	6,000	5,381	"	"
Osaka	6 digits with S. H. type	Horikawa	2,000	1,527	1927	"
"	"	Tennoji	2,500	2,193	"	"
"	"	Fukushima	1,600	—	in instal-	"
Kobe	5 digits with S. H. type	Minatogawa	5,000	4,513	1927	"
"	"	Suma	1,700	—	in instal-	"
Near Osaka	4 digits with S. H. type	Tengachaya	2,300	1,694	1928	"
"	"	Sumiyoshi	1,600	1,257	"	"
Near Kobe	4 digits with S. B. type	Mikage	3,600	—	in instal-	Siemens Bro. Co.
"	"	Ashiya	2,000	—	"	"
Kantung	4 digits with Strowger type	Dairen	6,500	6,223	1923	A. T. M.
"	"	Sakako	1,000	611	1927	A. E. I.
"	"	Bujun	800	625	1928	"
"	4 digits with S. H. type	Mukden	4,000	—	in instal-	S. H.

TOTAL NUMBER OF AUTOMATIC SUBSCRIBERS BY DIFFERENT TYPE OF EQUIPMENT IN 1928 AND 1929

Type of Equipment	Number of offices opened		No. of Lines equipped		No of Subscriber Lines actually equipped	
	1928	1929	1928	1929	1928	1929
Strowger	18	24	76,700	94,300	62,803	—
Siemens Haiske	7	10	25,400	32,700	21,714	—
Siemens Bro.	0	2	0	5,600	0	—
Total	25	36	103,100	132,600	84,514	—

The telephone area of Osaka having two automatic and 11 manual exchanges is divided into eight districts and six figures system was applied. The telephone plants in Nagoya, Kyoto, Kobe and Yokohama are arranged for five figures system.

We have studied about director equipment. Although this is complicated in itself, it has advantages in dialing and has flexibility for inter-office trunking. In the case of Japanese alphabets, however, as they consist of 48 letters and some sonant marks, it is quite impossible to put all those letters in 10 finger holes of dial. If we intend to forcibly put Japanese alphabets, the number of letters should be limited, and as the result of limitation the difficulties in choosing the office name will be attended. It is for these reasons that the director system was not adopted.

(b) *Subscriber's Number.* In the automatic exchange there are two kinds of subscriber, that is individual and party line with two parties and no coin box. In the telephone area which has more than 5,000 subscriber lines the message registering system is applied. As the numbering of party line subscriber is followed by jack per station system, all subscriber's number being given with four figures.

Trunking

(a) *Connection from manual or toll office to automatic office.* In Tokyo, Nagoya, Kyoto and Yokohama (no manual offices in Yokohama) the dialing device is equipped at every "A" position or toll position and the connection from manual or toll to automatic subscribers is completed by four digits dialing through the dialing relay group equipped at the outgoing end of the junction line. In Osaka and Kobe cordless "B" boards with impulse sending machines are equipped between automatic office and manual or toll office. In this case the connection comes from "A" board to "B" board by order wire and then connection to automatic office is completed by depressing the digit key at "B" board.

It is also expensive to equip the machine switching equipments for toll connection to the specially busy subscriber group with toll traffic. It is sometimes economical to make the connection manually in special toll incoming "B" positions at automatic office by order wire system. In Kayabacho office, Tokyo, the toll traffic is so heavy as to require 200 toll incoming junction lines for 2,300 subscribers.

(b) *Connection from automatic office to manual office.* The calls from automatic to manual are handled manually at the call indicator position which are installed in respective manual office. The number dialed by automatic subscribers is indicated at lamp field on "B," board, and the connection is completed by the operator through multiple jack. W. E. Co. type, A. E. I. type and S. H. type are used respectively in Tokyo, in Kyoto and Nagoya and in Osaka and Kobe.

Number of call indicator positions equipped is shown in Table 27. The construction as well as operating features are different according to the manufactures.

TABLE 27.—NUMBER OF CALL INDICATOR EQUIPMENTS IN 1928.

	Tokyo	Osaka	Kobe	Kyoto	Nagoya	Total
Type of Equipments	W. E. Co.	S. H.	S. H.	W. E. Co.	A. E. I.	A. E. I.
Call Indicator Positions.	109	26	10	4	8	17
Call Indicator Trunks.	2,955	19	260	110	269	630

"Adsole" Equipment

In Japan, the months of June and July are the rainy season and the humidity is the highest. As we have already the bitter experience with high humidity in the common battery manual system, it was considered almost impossible to adopt the automatic switching equipments to which high voltage, such as 48 volts, is always applied, without using any humidity adjusting device. Fortunately, an air drying device was practised by utilizing the adsole which is the special moisture absorbing reagent invented by the Chemical Research Institute and this device was applied for automatic offices to adjust the humidity.

Adsole is manufactured from acid earth, a natural product in the Echigo district of Japan.

(Continued on page 566).

Radio Broadcasting in Japan

By RIUJI NAKAYAMA, Managing Director, Broadcasting Corporation of Japan*

On November 29, 1924, a public service corporation under the name of Tokyo Hosō Kyoku (J.O.A.K.) was organized by sanction of the government to serve the broadcasting area around Tokyo and adjacent prefectures under the supervision of the Department of Communications. The late Count Goto was President of the Tokyo Hosō Kyoku, and Mr. K. Iwahara, Chairman of Board of Directors. The organization was strongly supported by the principal newspapers, banks, manufacturers and business firms of Tokyo, and many individuals contributed to the capital fund.

The first 500 watt station J.O.A.K. commenced activities on March 22, 1925, at Shibaura on the water front of Tokyo Harbor. This station was replaced in July by a 1 kw. station at Atagoyama Hill in the southern part of Tokyo city.

During the difficult time of reconstruction after the great earthquake and conflagration, radio played a most important part in comforting and encouraging the brave citizens who labored incessantly to rebuild their beloved city and their own homes.

Educational and recreational programmes, daily news and reports, made J.O.A.K. the popular favorite of Tokyo people. They hailed it as a great treasure, dug out of the silent ashes that still remained to remind them of the disasters.

The number of licences taken out increased astonishingly, from 5,000 in early spring to 100,000 in late autumn of the first year of activity, far surpassing the estimate of the promoters.

Following the good start of the Tokyo Broadcasting Bureau, similar organizations were formed in the cities of Nagoya and Osaka. Nagoya Broadcasting Bureau was formally recognized by the Department of Communications on January 10, 1924, and that of Osaka on February 28 of the same year. J.O.B.K.'s 500 watt station at Osaka was started temporarily on the roof of the Mitsu-koshi Building, on June 1, 1924; and Nagoya commenced activities with its 1 kw. station J.O.C.K. on July 15 of the same year, located in the premises of Nagoya Castle.

Both the Osaka and Nagoya Bureaux struggled hard for the first year under certain local handicaps, but they gradually improved and could obtain a considerable number of listeners.

Thus, in spite of the fact that broadcasting was quite a new enterprise in Japan, all three independent organizations worked under the supervision of the government for nearly eighteen months and built up a popular public service in each of their districts which surpassed public expectation.

National Organization

Following a trial of nearly eighteen months the infant broadcasting enterprises of the three principal districts proved their worth to the satisfaction of the public and the government, who had foreseen the advisability of forming a strong national broad-

casting organization, instead of independent bodies, so that the whole country might be served efficiently and economically.

With these public-spirited considerations in view, in agreement with the government's plan, the three broadcasting bureaux voluntarily dissolved their organizations and turned over their entire assets on August 20, 1925, to the newly formed national organization under the name of the Nippon Hosō Kyokai, (Broadcasting Corporation of Japan.)

The corporation is headed by Mr. Kenzo Iwahara, former chairman of the Board of Directors of the Tokyo Broadcasting Bureau. The working organization of the corporation is divided into two sections: the head-quarters at Tokyo being the administrative end of the service, and the regional divisions covering seven service districts being the operating end of the broadcasting service.

The main high power stations, namely Tokyo, Osaka, Kumamoto, Hiroshima, Sendai and Sapporo, commenced activities by June 1928. The land line for relay was put into commission in November of the same year just in time to broadcast the Imperial Coronation Ceremony of His Majesty the Emperor. The 10 kw. station for Nagoya was started in November, 1929, and the Kanazawa 3 kw. relay station by means of wireless, came into operation on April 15, 1930.

The following list shows the main stations, now operating, and their call signs, wave-lengths, powers and the number of listeners.



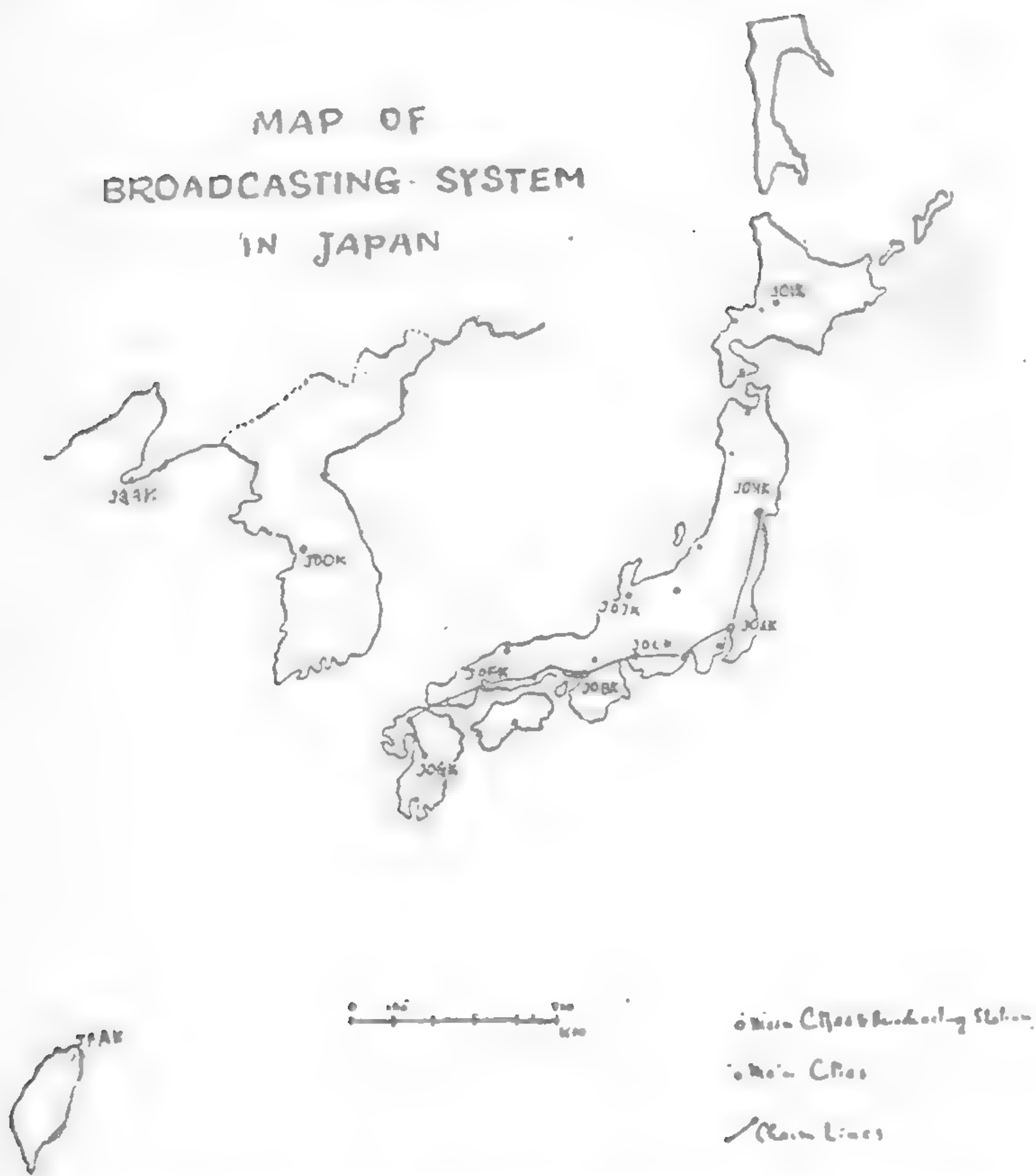
The Newest Cultural Communication Instrument
J.O.B.K. Osaka Broadcasting Office, Osaka

Locality	Call sign	Wave-length	Power	Licensed Listeners July 31, 1930
Tokyo . . .	...JOAK	345	10kw.	326,035
Osaka . . .	...JOBK	400	10	209,232
Nagoya . . .	...JOCK	370	10	71,105
Hiroshima . . .	...JOFK	353	10	26,226
Kumamoto . . .	...JOGK	380	10	25,493
Sendai . . .	...JOHK	390	10	25,418
Sapporo . . .	...JOIK	361	10	17,130
Kanazawa . . .	...JOJK	423	3	Included in Nagoya
Total . . .	...	...	...	700,639

Future Plans

After having completed seven fundamental 10 kw. stations in the principal cities and one 3 kw. station in Kanazawa, with more than 700,000 licensed subscribers, the Corporation is now adding five more stations to serve some of the intermediate sections rather difficult for reception direct from any of the main stations. These are mostly 500 watt stations, and are to be completed and operated by the winter of 1931. They are Nagano, Shizuoka,

* From *The Japan Magazine*.



Kyoto, Okayama and Fukuoka stations. After the completion of the above five, the Corporation has in mind to add again from twenty to thirty relay stations in other principal cities within a few years to come.

On the day of the realization of the last plan, it is expected more than 50 per cent. of the total population will have facilities for listening by means of a simple crystal set.

In addition to the difficult task of promoting the educational side of the programme one of the most urgent problems is how to meet the requirements of all listeners. The Corporation plans to apply the twin wave system both in Tokyo and Osaka within a year, and will extend this service to other localities in due course.

Programmes etc

In spite of the fact that Japanese radio waves reach various countries bordering on the Pacific, and occasional receptions of foreign broadcasting are reported by Japanese amateurs, no actual advance was made to relay foreign programmes for the benefit of the general public until January 21, 1930, when an attempt was made to relay the opening ceremony of the London Naval Conference by H.M. King George V of England and the speeches of envoys representing participating nations.

On February 9, 1930, between 11.45 p.m. and 12.34 the next morning (Japan time) Mr. Wakatsuki's (Japan's chief delegate) actual speech and his recorded one was clearly received and successfully re-broadcasted by all stations in Japan.

Past experience in the relay of international broadcasting have appealed to the public to such an extent that officials of the government and the broadcasting corporation are considering more than ever the possibility of exchanging important programs with distant countries. The Corporation plans to work on the construction of high power short wave stations to make this more practicable, but its successful accomplishment requires much study and technical research. Adaptability of program, adjustment of time differences, seasonal variations, fading, distortion, power, and wave-length, are a few of the problems that are now being fathomed.

More definite co-operating work between nations interested in successful international broadcasting is absolutely essential for the further promotion of international good will, and this good will can be enhanced in no better way.

Japanese radio programs can be divided into four, viz. General Information, Recreation, Social Education and Children's

Hour, as is shown in the accompanying diagram. Upon the introduction of the twin wave system, it is expected that the social education will grow quite bigger than it is at present. For serial talks and lectures of educational character, Japanese stations generally issue the texts for the convenience of the listeners. Among them the prints for language lessons are all the go, and a monthly magazine for the Children's Hour is well received by families of culture all through the country, and every month adds more subscribers.

TEN MAIN CITIES AND NUMBER OF LISTENERS IN JAPAN AS ON MARCH 31, 1930.

Cities	Listeners	Proportion of Listeners per mil.
*Tokyo	107,584	47
*Osaka	86,500	36
*Nagoya	28,879	29
Kyoto	18,620	25
Kobe	16,166	21
Yokohama	12,102	22
*Sendai	9,166	48
*Hiroshima.	8,994	33
*Sapporo	4,964	28
*Kumamoto	4,852	29

* Studio of Broadcasting station.

Development of Broadcasting in Japan

By V. H. G. PARKER

Engineering Department, Standard Telephones and Cables, Limited

During the year 1928 immense strides were made in the development of broadcasting in Japan. These developments were a natural sequence of the original scheme* projected when the Japanese Broadcasting Association was formed in 1926. Six new broadcasting stations, distributed over the three main islands of Japan, have been opened with the idea of bringing as many listeners as possible within crystal range of some station. Four of these stations serve areas which heretofore have been without local broadcasting service, while two of the installations—at Tokyo and Osaka, respectively—replace existing stations of lower power.

The new stations are each rated at 10 kilowatts unmodulated antenna power and are housed in entirely new buildings so as to leave the original transmitters still available in case of emergency. The only area not affected by the year's changes is that surrounding Nagoya, where a previous 1 kw. installation remains in operation. The map shows how the stations have been distributed among the main cities of Japan so as to cover as large an area as possible. Medium wave lengths are used throughout, and the entire broadcast wave length lies between 400 and 350 metres.

All call signs in Japan are given out in English and consist of four letters commencing with J. O. and ending with K. The third letter is different for each station and thus serves as a means of identification. The following is a list of the seven stations giving regular programmes, together with their call signs and wave lengths :

Sapporo JOIK 361.4	Sendai JOHK 389.6	Tokyo JOAK 375	Nagoya JOCK 360
Osaka JOBK 385	Hiroshima JOFK 353	Kumamoto JOGK 380	

R. E. A. Putnam "Broadcasting in Japan," *Electrical Communication*, Vol. V, No. 3, January, 1927.

The equipment of all the stations has been imported from England. Sapporo, Sendai, and Hiroshima have each been supplied with "Standard" Radio Equipment, designed and manufactured by Standard Telephones and Cables, Ltd., and installed by the Nippon Electric Company, Ltd.

Sapporo is the main city of Hokkaido, the second largest island of Japan; it has a population of 145,000, and owes its growth mainly to the public institutions established there by

the Japanese Government. It possesses an Imperial University which in the past has been mainly devoted to the study of agriculture. The town itself, unlike other Japanese cities, is laid out in blocks and streets like an American city, all streets crossing at right-angles. The winter in Sapporo and on the island generally is very severe. For five months in the year, most of the country is frost-bound and covered with snow, often to a great depth, and all the roads outside the cities then become impassable except by sledge.

The Sapporo Broadcasting Station was officially opened on June 5, 1928. By the end of July, 11,000 listeners had been registered.

Sendai, with a population of 143,000, is the chief town in the north of the main island. It is an important educational center and includes the famous laboratory known as the "Institute of Metallurgical Research." This laboratory is directed by Professor Honda. Important work in connection with cobalt magnet steel, better known as "K. S. Steel," has been done there. The University also gives special attention to radio research and has a very well-equipped laboratory for this purpose. Sendai is the headquarters of the Second Army Division, and many military students are quartered in the city. In the early part of the year, the Japanese Institution of Electrical Engineers held a large convention in the town. During this period, a very large number of visitors was shown over the station, which had just begun testing. The station was officially opened on June 23, 1928, and by the end of July 9,000 listeners were registered. The situation of this station is probably the most favorable of the three, and reports of very good reception have been received from all over the country—several from such distant points as New Zealand.

Matsushima, one of the three chief beauty spots of Japan, is situated only a few miles from the transmitting station.

Hiroshima, a port on the Inland Sea, is one of the chief military stations of the Empire. It has a population of 150,000, and is one of the most important commercial centers in the southern part of the main island. The country around



Line Amplifier Equipment

Hiroshima is very mountainous and is covered with vegetation. The neighborhood contains some of the most beautiful scenery in Japan, the best known being Miyajima, with its singular *torii* and famous shrine which, at high tide, appears to float on the water. The station was opened on July 5, 1928, for regular broadcasting, and reports of good reception have been received, notwithstanding the unfavorable nature of the country.

Building Arrangements

In designing the layout of the new stations, a general uniform plan was so far as possible adopted. Since Standard transmitters require less space than the other imported equipments, two

different floor plans, suitable for each type of equipment, were selected. The three stations, Sapporo, Sendai, and Hiroshima, were each built to uniform plan.

The transmitters have been located outside of and near to a main city, the distance being of the

order of five to six kilometres, while the main studios and general offices have been built on some convenient site in the town itself. The buildings housing the transmitters are constructed of reinforced concrete, and are made as strong as possible in order to withstand earthquake shocks. Possible expansion has been provided for and the transmitter rooms have been made large enough to accommodate second equipments. In each case, large power rooms containing the machines, main switchboards and water cooling pumps and radiators have been provided, together with the necessary overhead gears for moving the power units. The illustration below shows a corner of one of the power rooms containing the main switchboard and induction regulators. A control room containing the line amplifier equipment and a small local studio for announcements and general emergency work are a necessary feature of each station. A reception room, offices for the accommodation of the engineering staff, and a small workshop and

laboratory have been included.

Reliability and safeguard against interruption of the service have been the keynote of the general scheme, and all the main units of the equipment and power machinery have been duplicated where possible.



Sapporo Transmitting Station



Sendai Transmitting Station



Hiroshima Transmitting Station



Speech Input Equipment



Corner of Power Room, (Sendai)



Transmitter, Front View, (Hiroshima)

In pursuit of the general plan, the power supplies are obtained from two independent power companies, and the operation of a switch brings either supply into use in a few minutes.

Three-phase power is supplied to the buildings at 3,000 volts per phase, which is then transformed to 220 volts per phase for operating the radio transmitters. Induction regulators are employed to keep the voltage constant during variation of load. The water for the buildings, including that necessary for cooling the valves, is drawn from wells sunk in the grounds of the stations. This arrangement is considered adequate for the purpose, but the commercial town supply is also available in case of emergency.

The studios located in the towns are housed in concrete fire-proof buildings of two stories. They also contain the general offices and reception rooms.

Two studios are provided, one large enough to accommodate a small orchestra and to be generally used for musical entertainment, and a smaller one for news bulletins, announcements, and lectures. The control room is between the two studios so that the operator has both under his immediate control. Here, again, battery supplies and the main part of the equipment are in duplicate.

Equipment

The radio transmitters installed are rated at 10 kilowatts in the antennae, and they are of a type representative of the latest production of Standard Telephones & Cables, Ltd. They employ low power modulation in conjunction with master oscillation control of the carrier frequency—with the well-known advantages. The equipment is of the dead front panel type.

On account of the distance between the radio transmitter and associated studios, two sets of speech input equipment are provided with each station installation. That installed at the studio is the Standard ES-771 equipment, which includes the usual studio pick-up amplifier, volume indicating and control devices, and monitoring facilities for audibly checking the quality of the studio programme, either at the output of the studio amplifier or at the output of a radio receiving set tuned to the associated radio transmitter. The section at the right includes the spare

amplifier, volume control, and equalizer to meet local requirements, and is all wired up and available for emergency operation by merely throwing the necessary keys.

The second set of speech input equipment (ES-913-1) used at the radio transmitting station is generally similar to the studio equipment described above, except that the studio pick-up amplifier is replaced by a line amplifier inserted between the connecting wire line and the radio transmitter proper. While there is no provision for producing programmes at the radio transmitter station, nevertheless the amplifier equipment is arranged so that a microphone can be used for making emergency announcements. The illustration on page 551 shows a typical equipment, including a spare amplifier and equalizer in the panel section at the right. The narrow intermediate section is a signalling panel manufactured locally and intended for use in conjunction with a special signalling system obtaining in all Japanese stations. The additional amplifying and signalling sections have been mounted in the common frame line-up for ease of control by the operator.

The method of operation between the studio and transmitter is so arranged that broadcasting is controlled from the studio. The preliminary adjustments are made by setting the volume indicator on the speech input equipment to an output energy of two decibels above reference level, or to the highest level possible without interference with the line. A steady tone is applied to the input of the speech amplifier and the amplitude of the tone is adjusted by the gain control potentiometers until a deflection of 30 divisions is obtained on the galvanometer. The steady tone is then transmitted to the radio transmitter *via* the line amplifier, and the gain control potentiometers on the line amplifier equipment are adjusted until the correct degree of modulation is obtained, as indicated by the modulator valve beginning to show grid current. The line amplifier adjustment is then complete and any necessary control of the program is made directly by the studio operator. A permanent record of this adjustment is obtained by adjusting the volume indicator until the standard deflection of 30 divisions on the galvanometer is obtained, and making a note of the gain control and volume indicator settings.



Antenna Tuning Coil and Housing



Transmitter, Rear View, (Hiroshima)

Antenna

The antenna system at each station is somewhat different. Sapporo and Sendai have antenna of the simple T type, the former with two wires in the flat top and two parallel single lead-in wires and the latter with four wires in the flat top and a center down lead. Each antenna has a natural wave length above the operating wave length, and series condensers are necessary for tuning; the overall resistance of each antenna is large, but the efficiency nevertheless is high because the radiation resistance is high. At both stations an insulated counterpoise has been installed, and at Sendai a buried earth system is also available. Counterpoise systems were installed at these stations because of the high resistance of the soil, especially at Sapporo, where the ground is frozen over for six months in the year; subsequent tests at Sendai, however, proved that under normal conditions the increase in resistance due to the earth system is more than counterbalanced by the loss in effective height due to the counterpoise.

At Hiroshima station the antenna is of the multiple tuned type with three down leads. The center down lead forms the lead into the transmitter and is connected to the antenna tuning inductance. The outer leads are connected to earth *via* tuning coils similar to the tuning inductance.

The data tabulated below include main dimensions of each antenna. The heights are those at the masts, with the height of the counterpoise deducted, but without allowance for dip.

Station	Operating Wavelength	Length Flat Top	Height Actual	Type
Sapporo	361.4	42.4	47.4	Simple T type Counterpoise earth
Sendai	389.6	42.4	52.4	Simple T type Counterpoise earth
Sendai	389.6	42.4	60	Simple T type Buried earth
Hiroshima	353	70	35	Multiple Tuned 3 down leads Buried earth

N. B.—All measurements are in metres.

Simultaneous Broadcasting

In connection with plans of the Japanese Broadcasting Association for transmitting programs from the more important cities where better musical talent is available and for making announcements of a public and semi-public nature, the services of the Nippon Electric Company were enlisted to prepare plans for a trunking system suitable for linking up all of the Japanese broadcasting stations. This linking-up of stations was accomplished and the service made available during the period of the Coronation Ceremonies which took place in Tokyo and Kyoto beginning the 6th of November, 1928, and lasting for the greater part of the month. By this means, many of the details of these important ceremonies and also the associated programmes were broadcast simultaneously throughout the Empire.

Hokkaido, with its broadcasting station at Sapporo, had, unfortunately, to be left out of the general scheme on account of the strait, some 60 miles in extent, which separates it from the mainland. Telegraph cables crossing the straits are in existence, also some telephone circuits, but they are not of the type suitable for broadcast purposes. However, most of the programs were successfully broadcast from the Sapporo station by having first been picked up from Tokyo at 345 metres or from Sendai at 390 metres and re-broadcast on the Sapporo wave length of 361.4 metres. Due to the intense national interest in the coronation proceedings, the services performed by the broadcasting stations during this period were of the utmost importance and a source of great gratification to the broadcasting authorities and of satisfaction to the owners of receiving sets.

Future Developments

Owing to the mountainous nature of the country, the signal strength from any station varies considerably with the locality, and there are a few large cities situated quite close to a broad-

casting station where reception is very poor. Consequently, it is probable that the present main stations will be supplemented by small relay stations of two to three kilowatts capacity, provided there is sufficient demand for the service. It is probable also that the old one kilowatt transmitter at Nagoya will shortly be replaced by one of ten kilowatts, thus bringing it into line with the other high powered stations.

Aviation in Asia

LORD THOMSON, British Secretary of State for Air, lecturing on the progress of aviation in Asia at the anniversary meeting of the Central Asian Society in London, declared that British aviation was non-existent in Central Asia, being confined to the fringes, the northern frontier of India, and in Arabia. While the Imperial Airways has a regular weekly service to India, the Royal Air Force plays an important part in both regions. As an instance of its activities in Asia, the distribution of one squadron just before the evacuation of Europeans from Kabul was quoted by the lecturer. Of ten Victoria troop carriers stationed at Hinaldi, near Baghdad, on that day, two were at Aleppo with the High Commissioner from Iraq, two were at Risalpur on the North-West Frontier, three were on their way to that frontier *via* the Persian Gulf, and three were at their base. For the relief of Europeans in Kabul, seven similar machines were flown from Baghdad to Peshawar, a distance of 2,500 miles, and assisted in evacuating 586 people without mishap to a single passenger.

Air services already being operated between Europe and Asia are the British air mail to India and the French service to Beirut. Dutch, French and German lines are contemplating services to Baghdad. In Persia the Junkers firm has played a leading part in the development of civil aviation, and four air routes radiate from Teheran to Pahlevi, Meshed, through Shiraz, to Bushire, and through Hamadan to Baghdad.

Russia forms a link between Europe and Asia. There is a service every week-day from London, through Berlin, Moscow and Sochi, on the Black Sea, to Baku, thence weekly to Teheran, and from there twice weekly to Bushire, a journey occupying 61 hours 50 minutes actual flying time. Russia now has aviation centers at Tashkent, Samarkand, Termes, Kabul, Lake Aval, Khiva, Chirchik, Semipalatinsk, Sergiopol, and Alma-Ata. The most important link is that between Moscow and Tashkent, which will give Russia access by air to the whole northern frontier of Afghanistan and to Mongolia and Sinkiang. The line from Tashkent to Kabul is to be operated once a week throughout the year.

Three new air lines have been added to the Russian network this summer, and have increased the total length of airways from 7,438 miles to 11,445 miles. One of the lines, running over the Caucasus Mountains to Baku *via* Tiflis, completes the former air connection between Vladikavkaz and Baku. The two other run through Siberia, one, from Moscow to Irkutsk, being the first step towards establishing services to Japan and China, the other connecting Semipalatinsk, in South Siberia, with Alma-Ata, in the Soviet Republic of Central Asia. New lines planned for the next three years will raise the total length of airways to 25,955 miles.

The Russians have made considerable strides in aircraft and aero engine construction in recent years, mostly following the German model. Many types of purely Russian design have already been produced. Germany is largely interested in Russian developments, and if friendly relations can be established with Russia it is possible that a joint arrangement will be made for the operation of the route from Moscow to Irkutsk, Urga, Peking, Nanking, and Shanghai. France is planning to fly in co-operation with the British and Dutch to Rangoon and thence to Bangkok and Saigon, and also to Hanoi and on to Canton.

Chinese lines are being worked between Nanking and Shanghai, and also between Hankow and Shanghai, with the assistance of an American company. A line from Canton through Hankow to Peking is planned. Japan has started the line from Tokio through Osaka to Dairen, in Manchuria, but according to Lord Thomson the results so far are disappointing.

Tokyo's Street Paving Program

ALTHOUGH Tokyo officially celebrated the completion of its Earthquake Reconstruction Program in March last, the city still faces the task of completing the surfacing of its new street system. A tentative program calling for the expenditure of Y.10,000,000 over a period of eight years for asphaltting the streets has been drawn up and approved. The following general outline of the Roads in Tokyo is of interest in gathering an idea of pre-earthquake conditions and what has been accomplished under the Re-Construction Program.

The roads of Tokyo before the earthquake were mostly relics of Yedo days. The road plan of Yedo days was drawn mainly with an idea of being prepared for street fighting, and was full of bends and windings with the Yedo castle (the present Imperial Palace precincts) for the center. In consequence the streets of Tokyo abound too much in inflexions and crookedness at the cost of systematization. Besides they are generally narrow, and become fearfully muddy in the rain, so that they are exceedingly unsatisfactory as thoroughfares of a great metropolis. The City of Tokyo has long since taken the matter into consideration, and has been making efforts to effect improvements of roads and streets from as far

boundary adjustment and many other plans and projects. The road and street plan provides that the road system of Tokyo shall have a basic trunk road of 33 to 44 metres in width running from south to north and a transverse basic trunk road of 27 to 36 metres in width, with roads and streets of different width running parallel to either of the basic trunk road. Besides this checkered pattern the city is to have the radial roads and a girdling boulevard, the former radiating from Tokyo railway station. Roads and streets of 22 or more metres in width are designated as trunk lines, and there are to be 52 of them with an aggregate total length of 119 kilometres. Roads and streets of 11 to 22 metres in width are designated as sub-trunk lines, and there are to be 122 of them with an aggregate total length of 139 kilometres. Besides these there are to be what are called boundary adjustment roads of three to 27 metres in width, to be cut newly as the result of land boundary adjustment. When all these roads and streets are completed the total area of roads and streets will be increased by about 1,100,000 tsubo, compared with the area before the earthquake, with the result that the roads and streets in the fire-destroyed district will come to occupy 27 per cent. of the whole area of the said district, a



TOKYO MUNICIPAL
ASPHALT
PLANT



back as 1880. Roads that offer free traffic for automobiles are yet very few in number, innumerable narrow pathways running between them that cannot but occasion great concern from the point of view of maintaining peace, health and sanitation and safety of traffic.

The aggregate area of streets in Tokyo before the earthquake was 2,800,000 tsubo or 11.6 per cent. of the entire area of the city. A revolutionary improvement of roads and streets was a matter of absolute necessity. But the axe of improvement could not be used drastically on busy business centers all at once, owing to old usages and individual economic considerations. But the great earthquake did its part in burning down more than a half of the busiest center in downtown quarters of Tokyo, and unexpectedly gave the city people an opportunity to carry out their long-standing desire thoroughly to improve the roads and streets by reconstructing and widening them.

It was the same in Yokohama as in Tokyo, that its streets and roads were narrow and full of bends and crookedness and were not fit to meet the needs of modern active city functions.

The road and street plan is one of the most important of the work of reconstruction, being made the basis of the land



percentage that will bear comparison with London, Paris, and Berlin, and will thus prove a decided innovation in comparison with the uptown districts which escaped the ravages of fire.

In Yokohama the roads and streets plan comprises 22 lines with an aggregate total length of 43 kilometres, which have to be laid out newly or reconstructed. Besides this the Tokyo-Yokohama national highway coming under the charge of Kanagawa Prefecture (that part which lies in Kanagawa-ken) has been completed

together with that part which comes under the charge of Tokyo prefecture and lies within Tokyo prefecture, constituting a first class national highway.

Principal Points in Laying Out Roads and Streets: To speak generally, the following are considered the principal points of importance in the actual work of laying out roads and streets in the course of executing the reconstruction plan:

1. The width of roads shall be given in metres.
2. The *status quo* shall be maintained in the present demarcation except where adjustment is deemed especially necessary.
3. The width of roads shall be made at least 27 metres where there is a possibility of an under-ground railway being laid.



"Erie" Caterpillar Shovel



Macadam Roller and Scarifier



Working on No. 36 Road Near Shiba Park



Laying Asphalt



Koehring Paver



Cement Spreader on Eitai Bridge



Asphalting Road in Front of Imperial Palace



Asphalting on Yedo Bridge

4. The width of roads shall be at least 22 metres where an electric line is to be built on it.
5. The line of roads decided upon by the old municipal plan shall be as far as possible adopted.
6. The old electric railway lines for which permits have already been obtained shall as far as possible be adopted, and where land has already been bought up, special attention shall be paid to using it.
7. Attention shall be paid to minimizing the removal of objects laid underground.
8. When the existing roads are to be widened, the rule shall be to adopt the method of widening them on both sides.
9. Roads and streets shall be cut as far as possible avoiding such permanent buildings as escaped the earthquake damage.
10. In the case of roads and streets of not more than 22 metres in width, their existing lines shall be utilized as far as possible without taking too seriously into consideration their crossings and crookedness. At the same time they are to run systematically with the trunk lines if at all possible.
11. In so far as is practicable the crossings of roads shall be chosen in fixing the point of turning for a road or a street.
12. With regard to residential lots situated between a river or canal and a road or street running parallel to that river or canal, such residential lots shall be so formed as to retain adequate breadth in due proportion to the width and position of the river or canal to make their utilization as much effective as possible.
13. The incline of roads and streets of 22 or more metres in width shall not be more acute than one twenty-fifth.

14. The crossing of more than two roads shall be avoided as far as possible and where unavoidable care should be taken not to have more than two roads cross one another at one and the same point. Where possible a space shall be reserved, to form a safety island, for easier traffic control.
15. In building a bridge, its position shall be so selected that it may not lay out of line with the roads leading to it.
16. In widening a road that runs close to a large sewer, the latter shall be covered over or reconstructed so that it may be utilized as part of the road.
17. Residential lots along a trunk road shall be made greater in depth in comparison with those along auxiliary roads.
18. With regard to residential lots that run parallel to a trunk line, the road demarkation shall be so planned that their width shall be 2 to 4 times the width which is at a right angle.
19. The street corners shall be rounded to a reasonable degree.
20. Open spaces shall be provided at the approaches to a bridge.

Street Paving: The streets of Tokyo have remained the same hallasted roads as of old. In recent years, however, the use of automobiles and motor cars has greatly increased, and traffic has become very much complex, to the great damage of roads, not infrequently occasioning danger to pedestrians as well as to vehicles. In addition to this the general demand for progress would not be satisfied with imperfections in road service. Just at the time the city administrators were racking their brains for means to meet the situation, the Emperor graciously made a grant of Y.3,000,000 especially to the street pavement fund in 1920. The city did not fail to seize the opportunity to take in hand the work of paving the principal streets of the city at an outlay of Y.40,000,000 as a



Gasoline Roller



Wood Block Paving



Model of Street Construction, No. 7 Main Highway Rear of Tokyo Main Railway Station

seven year undertaking from 1921. Being overtaken by the great earthquake disaster in the midst of the progress of the work, the city was obliged to change its program, and suspend temporarily the execution of the plan in the fire-swept districts, proceeding first with the paving of the uptown quarters, which had escaped the conflagration. The work is, however, now in progress in the burnt districts, along with that of widening and laying out new streets, the cost being paid out of the reconstruction budget, instead of the old plan appropriation. In the pavement of streets cut stones, wooden blocks, asphalt, bricks, or concrete are used according to

the condition of traffic, the local state of affairs, the lay of the road, and the nature of the soil.

The actual area of paved streets, most of which were surfaced since the Great Earthquake, is now 3,643 acres, according to municipal statistics, which is approximately 823 acres more than the total before the disaster. Of this, about 1,608 acres represents arterial thoroughfares traversed by street car lines, virtually all of which have been paved. The unpaved area now existing within the city limits comes to 2,033 acres.

(Continued on page 566).



Cross Section Model of No. 1 Highway Showing Subway

"Colfix" in the Far East

Of interest to all municipal and government highway engineers throughout the Far East is the new Colfix asphalt binder which is poured cold and does away with much unnecessary equipment. Not only is this an advantage in new construction but in economical cold patching and repairing. The vast amount of new municipal roads necessary to modernize the cities and towns of China, calls for some method of rapid and efficient construction. Colfix, a pure bitumen emulsion is eminently suited to meet these conditions.

The efficiency, economy and durability of this novel product are being demonstrated on hundreds of miles of splendid pavement throughout all the principal countries of the world.

Although a comparative newcomer in the Far East, this Cold Asphaltic Binder is by no means experimental. There are already several factories in the Far East. Shiploads of American asphalt are exported from the United States monthly, for use in the manufacture of COLFIX.

Colfix is not a new method of road or street construction, but merely high grade asphalt in a new and more convenient form, a liquid having the color of chocolate and the consistency of coffee. It is composed of pure bitumen held in suspension (in water) by an infinitesimal amount of neutral emulsifying agent. Colfix is used cold. It remains fluid in storage for many weeks. After application to road metal, it breaks down in a few minutes, forming a uniform black coating of the same pure, sticky asphalt which was emulsified.



Colfix Pressure Tank Wagon Filling up by Suction Instead of Returning to Works to Fill by Gravity



Colfix is the result of years of intelligent and painstaking research by prominent paving experts and chemists, directed toward the elimination of the difficulties inherent in the use of hot asphalt for highway construction and maintenance.

Although asphalt has been used as cementing material since ancient times, the comparatively recent perfection of a commercial process of emulsification is probably the first really revolutionary development in its history. By this process heavy sticky asphalts are made as fluid as water and may be as easily used. Asphalt is now made available for many forms of construction for which it was



"COLFIX" SURFACED ROADS IN MACAO

Top: Rua Nova de San Lazaro: First Application January, 1929, No Second Coat Necessary to Date

Estrada Adolfo Loureiro; First Application March, 1928, Second in April, 1929

Rua de San Miguel: Covered with a Layer of Colfix Spray in January, 1929. No Second Application Necessary to Date



Singapore: Bideford Road Covered with Colfix

previously unsuited. The oldest of cementing materials appears in a new form but it is still the same reliable binder which has withstood tests of the ages.

Colfix is handled cold and is applied to the road at atmospheric temperatures in any except freezing weather. Ordinary commercial asphalts require heating to high temperatures in order to obtain and maintain proper working fluidity. In constructing penetration macadam with hot asphalt it chills and congeals when it comes into contact with cold stone, and full penetration and uniform distribution are thus prevented. As a result of quick chilling, an excess of asphalt is deposited in the surface of the pavement, which prevents the filling of the lower voids with screenings.

Colfix construction combines the meritorious features of the two well-known types of hot asphaltic pavements—this is, the rock particles are interlocked as in hot penetration macadam and thin coatings of asphalt are obtained as in closely controlled and more expensive hot plant mixed asphaltic concretes.

Research studies have shown conclusively that excessively heavy coatings of asphalt on the aggregate in asphaltic concrete are invariably accompanied by decreased stability. The injurious effects of such excesses have in recent years led to a gradual reduction in percentage of asphalt until the best modern practice requires a minimum amount of asphaltic binder, and results in extremely thin coatings. Carefully graded aggregates combined to produce the maximum density obtainable in hot mixtures are effectively coated with as little as $4\frac{1}{2}$ per cent. to $5\frac{1}{2}$ per cent. asphaltic cement, resulting in completely waterproof pavements of permanent stability. The amount of actual bitumen used in penetration macadam construction with Bitumuls approximates the amount used in the best hot plant mixed asphaltic concrete.

In order to make clear the advantages of Colfix Construction over Hot Penetration Methods it is necessary to give brief consideration to difficulties which are encountered in the latter type of work.



Singapore: Bideford Road Covered with Colfix

Commercial Asphalts are fluid only at relatively high temperatures. When hot asphalt comes into contact with cold stone it congeals quickly and will flow only when *en masse*. Because of this and because of the inability to secure proper penetration after key stone and screenings have been applied, it is usual practice to leave the stone open until after the first application of hot asphalt. This makes it possible to fill the "voids" between stone particles with asphalt to a depth of two or three inches. Thereafter due to presence of congealed asphalt in the interstices, stone chips or fragments cannot be worked into the pavement, and the benefit of the full interlocking and wedging of rock particles necessary for maximum stability is not obtained. Voids in the lower portion of the Macadam which were not filled with asphalt remain as "voids." Key rock can be forced into the voids on the surface only. In hot weather because the "voids" are filled with asphalt instead of stone fragments, such a pavement must depend for stability on hardness of the asphalt. The use of really hard asphalt however is not practicable because of injuriously high temperatures necessary to render such asphalt fluid, and difficulties of securing penetration due to quick cooling. Usually a compromise is made between the softer asphalts which penetrate more readily, have high ductility and stickiness, and the hard brittle asphalts which would give greatest stability but which are not workable, by using an asphalt having a penetration of 90 to 150. This grade, is however, soft and plastic at normal summer temperatures, and with excessive quantities of asphalt present, stability is entirely dependent upon such interlocking of rock particles as may have been secured even without stone chips in the lower "voids."

In some regions even softer asphalts and road oils are used in lesser quantity and "voids" left open in the lower portions of the pavement. Where there is no tendency for mud to come up from the subgrade or ice to form in the open pavement such construction is sometimes successful. It is not safe practice except under unusually favorable climatic subsoil conditions.

In hot penetration pavement, for the reasons pointed out, there is unavoidably a great excess of asphalt over the quantity required for binding. It is not unusual to use eight per cent. to 12 per cent. by weight of asphalt where two per cent. to three per cent. would be the maximum amount used as a binder in a hot plant mixture with the same coarse grading.

A reduction of cost over either hot mix or hot penetration type results because it is not necessary to heat Colfix for penetration, nor is it necessary to heat the aggregate as for hot plant mix. Most of the roads in the International Settlement of Shanghai are covered and sprayed with Colfix, it is fast becoming the only road material.

Book Review

"ARITHMETIC INVESTIGATIONS OF HEAT TRANSPOSITIONS IN THE LOCOMOTIVE BOILER BARREL."—By Dr. U. Barske. 81 pages with 45 diagrams and five calculation tables. Size 15.21 cm. Published by: Hanomag-Nachrichten-Verlag G. m. b. H., Hannover-Linden Postfach 55. Price RM 3.

In the first part of this work there are derivated in consideration of the latest findings in heat transference research exact mathematical equations which allow a determination of the course of temperature in boiler tube, flue tube and superheater tube. The method of the calculatory treatment is absolutely new for the various superheater types.

The second part shows examples for the practical use of the equations obtained, the application of which is essentially facilitated by the addition of diagrams and calculation tables. The usefulness of the indicated method of calculation is proved in conclusion by a comparison of the calculation and test results.

Beyond the scope of locomotive construction proper, this work should be of interest to every heat engineer where those designing practice a case of heat transposition similar to that of the locomotive boiler barrel occurs. The method of derivation may always be applied advantageously and make possible the calculatory treatment of such cases so that the booklet can be recommended to any heat engineer.

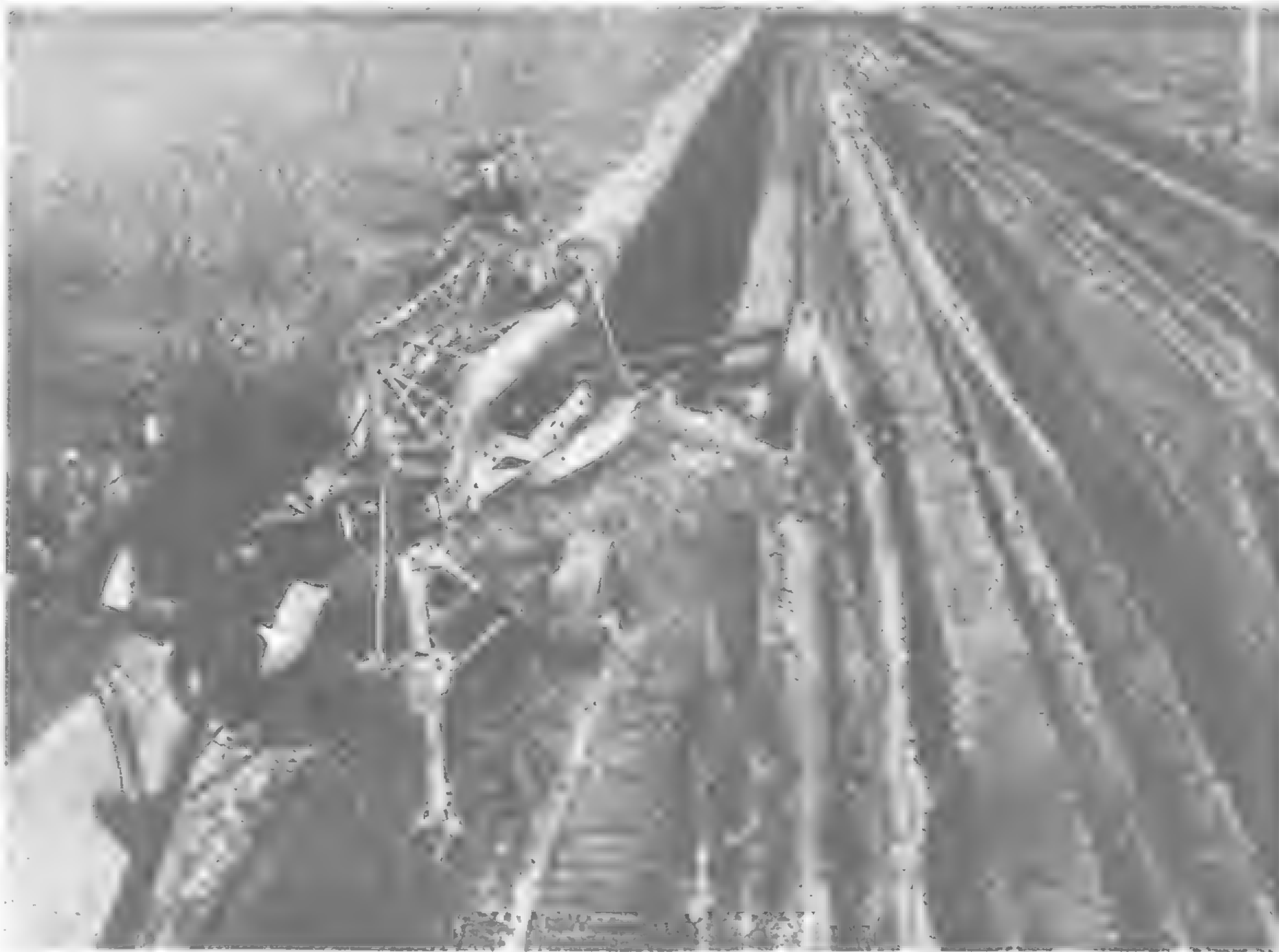
CHINA'S AWAKENED INTEREST IN HIGHWAY BUILDING

By STANLEY A. ZWEIBEL

THE history of the economic and social development of any country from the glorious rise of Rome to the present outstanding progress made by the United States, shows a very intimate and direct relation to the amount of satisfactory roads constructed to provide quick and economical transportation for persons and goods between all centers of population. The greater the geographic area of a country and the greater its population, the more urgent and important is the need for adequate transportation facilities to all sections. A nation made up of many provinces and each province of thousands of community centers cannot hope to make progress socially and economically without easy intercommunication and suitable means of economically transporting its products from the place of production to the centers and places of consumption. The political unification and solidification of a country depends more than on any other one thing upon adequate facilities presented to its people for the free interchange of everyday business and social relations. What lesson can China learn from this experience of other countries? The answer is to build more and better roads;

arterial highways running north and south and east and west through the provinces and feeder roads leading from the interior to these main trunk lines.

For the present, the construction of railroads is out of the question because of the enormous costs and length of time required before any transportation of passengers or freight would actually begin. The aeroplane has not as yet demonstrated the degree of safety demanded by the public nor have passenger transportation costs come within the range that will permit the great masses of the public to enjoy its service. It certainly has not become a factor as a means for low cost freight transportation. The old China proverb of the value of good roads is applicable to-day to



A Caterpillar Drawn Road Grader at Work Building a New Road Across Country.



Caterpillar Elevating Grader Building A Road Bed. This Machine Drawn by a Caterpillar Tractor will cast 81,000 cubic feet of earth in ten hours at a cost of six one-hundredth of a cent per cubic foot. It is estimated that a Chinese coolie will cast about 100 cubic feet of earth at a wage of about 40 cents per day.

MODERN ROAD BUILDING IN CHINA

Demonstrating Caterpillar Road Machinery on the Peiping-Tientsin Highway



Demonstrating Modern road building Machines on Peiping-Tientsin highway



A demonstration of Modern road building equipment on the Peiping-Tientsin Highway



A demonstration of Modern road building equipment on the Peiping-Tientsin highway



Native Chinese operators who have been trained to successfully handle Modern Road Making Machinery on the Peiping-Tientsin highway



Demonstrating Modern road building Machines on Peiping-Tientsin highway



Caterpillar road building equipment starting out in Mongolia

a much greater degree and has a much greater possibility in affecting the general welfare of country than when it was written.

The good roads movement in China has long been a subject of a more or less academic discussion but fortunately in the last few years a considerable impetus has resulted in actual accomplishments.

The minister charged with the responsibility of directing and supervising the Provincial and National communications, the executive directly in charge of the management of Provincial highway affairs, and the leading thinkers of China in the field of economics, sociology and national welfare are openly committed to support this movement, and to the direct relation of an adequate network of good roads to the general prosperity of the nation.

The National Good Roads Association of China, with its head-quarters at Shanghai, was organized in 1921 under the direction of Dr. C. T. Wang and Mr. Wu San, who have ever since acted respectively as president and chief executive secretary of the Committee. The Association was started without any sinking fund or subsidy from the Government; supported by voluntary contributions only. Twenty-seven branches of the Association in various districts of the country were organized. Active co-operation between the Shanghai office, the branch offices of the Government bureaux of public construction has been maintained for joint action in promoting the building of roads. In tracing the process of development of road building work during

the last ten years, the estimated mileage in 1921, when the Association was first organized, was only 20,000 li (one li equals about one-third mile). In the second year of its existence, the total went up to 14,000 li. Subsequently, rapid progress was made each year, and in 1930 there was an estimated of total 84,000 li; over forty times that of ten years ago.

The benefits derived from good, quick and cheap transportation as the result of the network of satisfactory roads and highway built throughout the country, are in a large measure directly responsible for the great national wealth of the United States. Undoubtedly the most important responsible factor was the automobile; first the pleasure car, then the delivery truck and afterwards the bus. The introduction of the mechanically driven car forced the issue of more and better roads. Now there exists a federal bureau of highways. Each state has its bureau or department of highways, likewise each country, township and city. In most of the states the revenue is obtained from a tax of one cent or two per gallon on gasoline. The millions of automobiles in use return to the state highway department treasuries funds enough to enable the continual building of new

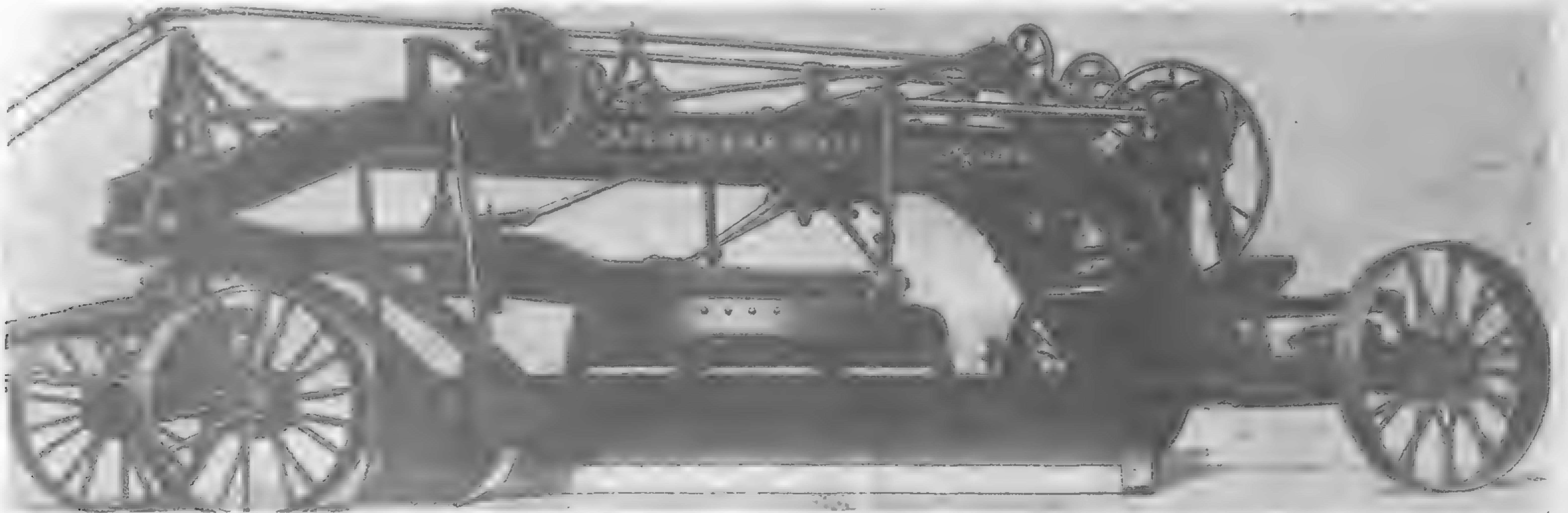
roads, to improve by hard surfacing the important trunk lines, and to continually maintain in satisfactory condition all of the highways, whether they be dirt, cinder, gravel, macadam, bitulithic, brick or concrete. Upwards of 30,000,000 automobiles of all kinds are in use, travelling over approximately 300,000 miles of improved



A road grader at work



Modern Caterpillar drawn road building machines at work on city streets in Mukden



The type of road grader being demonstrated in China

highways and over a total of approximately 600,000 miles of roads if we include those to which hard surfaces have not as yet been applied. Without the vast number of high speed power driven vehicles this extensive elaborate highway development would not have been accomplished. A truthful statement can be made of

the reverse of this situation. Any country, and especially one whose potential possibilities have not been released or even touched, that concerns itself with an active highway building accomplishment that will invite automobile pleasure cars, freight transportation trucks, and passenger carrying busses to travel these highways, will greatly enhance the general economics of the territory coming within the sphere of influence of these transportation activities.

First, by furnishing quick, cheap and satisfactory transportation of passengers and commodities from the points of production to the centers or places of consumption and thereby extending the markets for the products of the farmers and manufacturers. Secondly, by creating a large number of entirely new kinds of wage-earning occupations such as; chauffeurs, bus and

truck drivers, bus ticket collectors, tire repair men, mechanics, blacksmiths, electricians, etc. A more or less remote result, but nevertheless one influenced by any increase in the number of vehicles in use is the vast number and wide range of wage-earning occupations brought about by the need for all kinds of accessories

such as; gasoline, all kinds of lubricating oils, spare parts, tools, paints and painting, washing and cleaning materials, not to mention the possible manufacturing here in China, when circumstances permit, of such accessories as can be made as well and cheaper than those obtained from abroad.

In the United States, as well as in other western countries, there are thousands upon thousands of first class improved high-

ways over which many thousands of pleasure automobiles, busses and trucks travel daily. In many sections of the United States there is an average of one mile of improved highway for every square mile of area. It is possible to travel comfortably by bus on improved highways all the way from San Francisco clear across the continent to New York City, a distance of some three thousand



A tractor drawn rotary scraper for hauling earth from the side of the road up onto the roadbed.



Road grader building a new road



Modern road machinery are so powerfully built that they find no difficulty in working under very adverse conditions

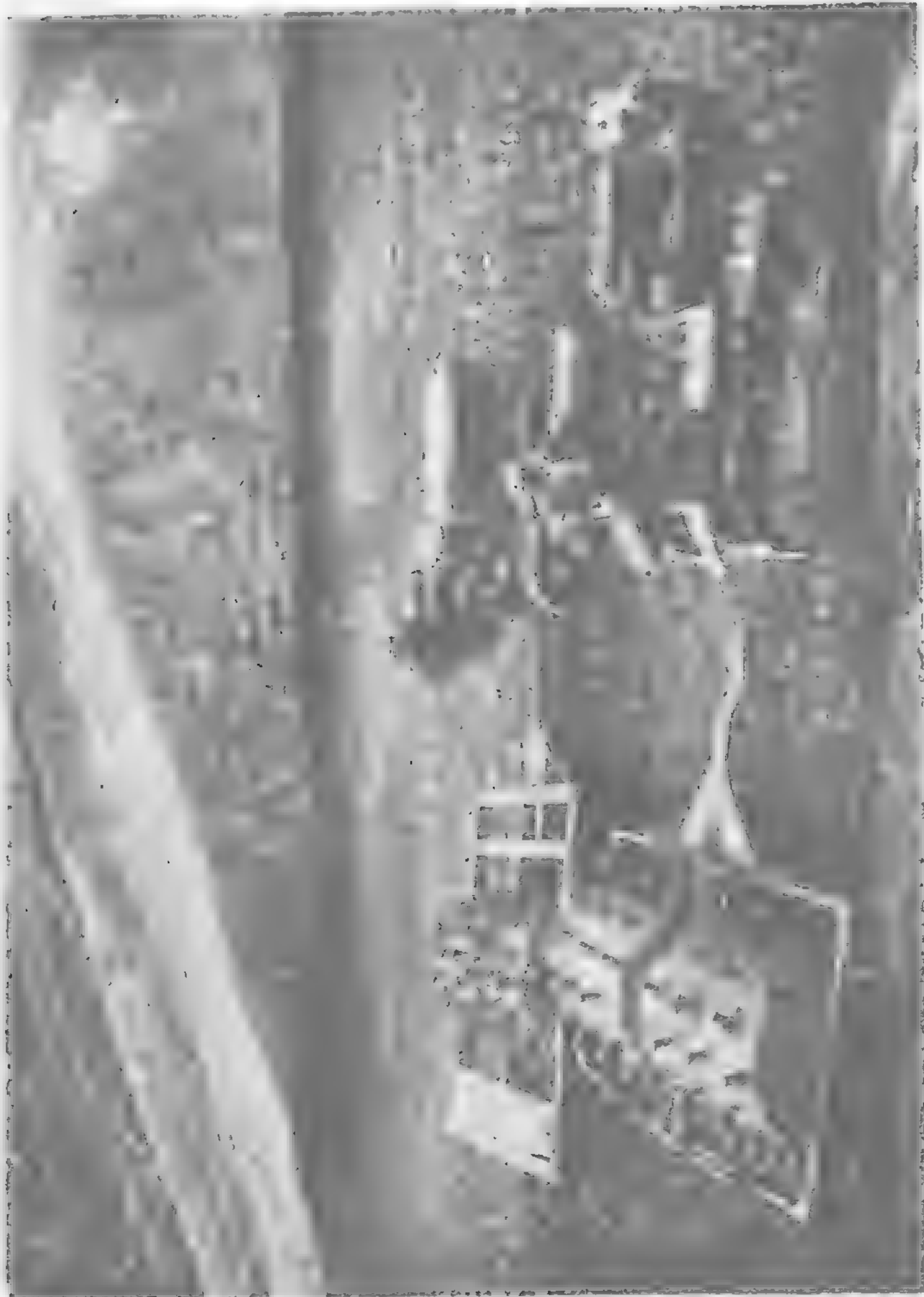
MODERN ROAD MAKING MACHINERY



Rebuilding a dirt road in mountain district. Two road graders and two Caterpillar Tractors at work



Caterpillar Elevating Grader drawn by a Caterpillar Tractor casting the dirt from the edges to the center at the start of building a road across country.



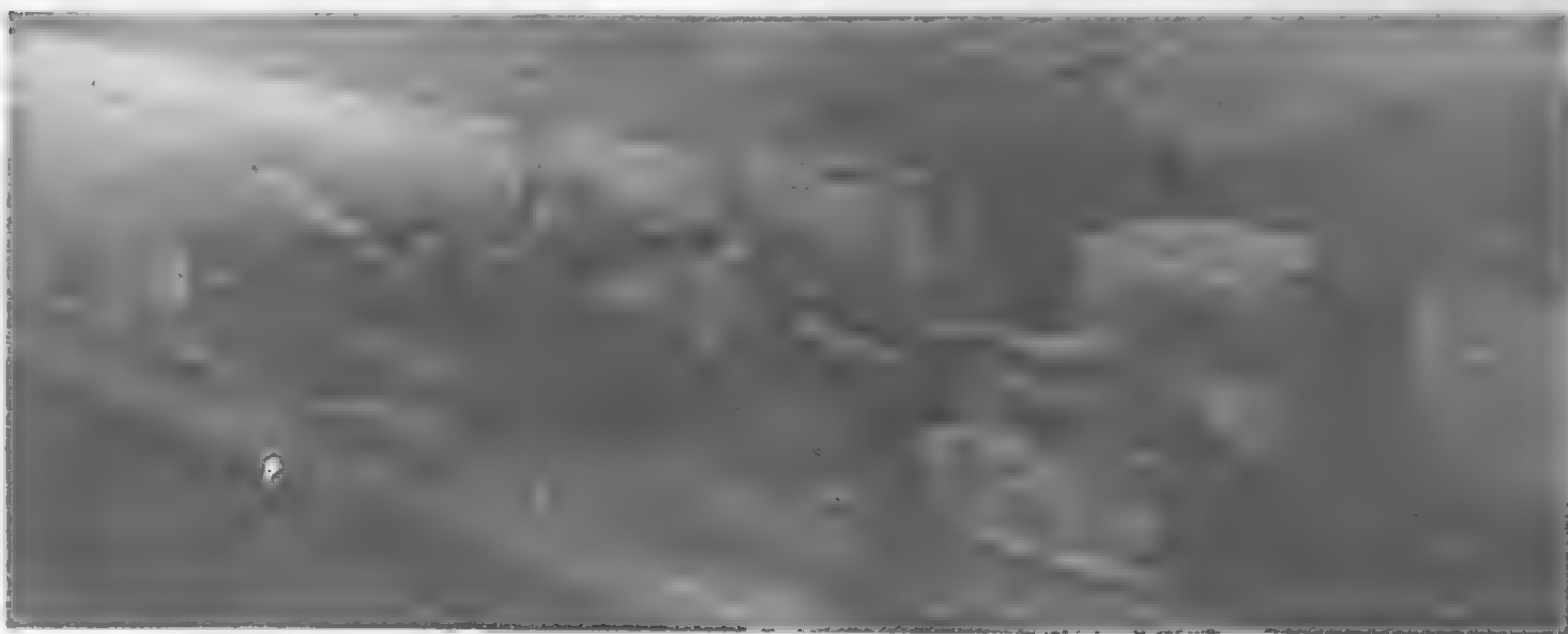
Smooth surface rollers are ineffective for the purpose of packing loose earth in that they only pack a shallow layer at the surface. Modern "sheepsfoot" rollers are required to properly pack the loose earth of a new road bed.



Caterpillar Elevating Grader starting the work of casting dirt to raise the level of the road two feet above its former level

miles and with sleeping and eating accommodations as desirable as those obtained on the railroad. The surface of all the highways are continually maintained in satisfactory condition, making possible, in the open country, an uninterrupted speed of fifty to sixty miles an hour. Many of the railroads operate on the branch highways their own busses and trucks which serve as feeders for their main trunk lines.

The introduction of the present day pleasure automobiles, heavy busses and trucks make absolutely necessary a more substantial road bed than was formerly fairly satisfactory for the pedestrian, the ricscha, the wheelbarrow or even the two-wheel cart. The sheer weight and the terrific pounding of modern automotive vehicles of all classes require roads with surfaces that are hard enough to prevent penetrating; properly sloped and graded to facilitate drainage in rain weather so that they are continually usable throughout the year; smooth enough to make passenger travel in the vehicles a pleasure



A Caterpillar drawn road planer that keeps the surface condition of the highway in a smooth satisfactory condition at a very low cost. One man only is required to operate it.

machine is constructing an average of two miles of dirt road a day at a total cost of approximately \$15 Mex per mile.... Not only



Road grader building a new road



Beginning the building of a new road across country

and not an agony; and permit a reasonable speed that will reduce transportation costs to a minimum. It is a practical impossibility to construct by hand labor roads that will meet these present day requirements. Convincing evidence of this fact is obtained by travelling on any of the highways in China. The bumpy unevenness of the road surface shows the exact location of each shovel-full or basket-full of dirt in its construction. No amount of hand labor will correct this corrugated, washboard surface condition. For a real substantial smoothing of the road surface only such modern road building machinery like Caterpillar-drawn Road Graders designed specifically for the purpose, which have been developed for use in building roads in the western countries will be found capable of producing the desired results. Their use is absolutely essential for the proper construction of suitable roads in China.

For the past several months Caterpillar Tractors and Caterpillar Road Graders have been demonstrating modern methods of road building in the north on the Peiping-Tientsin highway. A powerful Caterpillar Tractor pulling a heavily constructed Caterpillar Road Grader, with one operator on each



Loosening hard soil at the side of the road so that it can be easily cast over to form the new road bed

is this cost a small fraction of what a similar length would cost when done by so-called cheap labor of the natives, but the modern machine-finished road is properly crowned and graded and the surface is uniformly smooth and inviting to vehicular traffic. The type of road grader being demonstrated is a four-wheels heavily constructed chassis which has suspended between the front and rear wheels an eight foot tool-steelled blade which is adjustable in all directions. As the grader is pulled along one side of the road by the Caterpillar Tractor the outer end of the blade is tilted to a sharp angle downward thus digging down into the edge of the road to make the drainage ditch. The dirt it digs up is carried along the blade and deposited toward the center of the road; a similar operation is performed coming back the other side of the road. A couple of trips up and down the center pulverizes, mixes and distributes the dirt uniformly and produces the desired crowning effect with a uniformly smooth even surface.

At the first sight of the Caterpillar Tractor, the Chinese in that section viewed it with great curiosity and referred to it as "the fire devil that crawls on its belly." It is propelled

by a four cylinder gas engine and travels not on wheels but on an endless chain-like track on either side. Each link of the track has wide steel shoes or plates bolted onto it for gripping the ground in obtaining its traction and this chain extends over the front and rear sprocket wheels.

Roads built by famine relief organizations, by companies as commercial ventures, by provincial highway departments or by national government highway departments not only can be economically and properly rebuilt with these machines but they are designed and constructed to build satisfactory new highways over a new and original right of way, across rice fields or mountains.

A native highway engineer, who has had considerable experience in highway construction in the province of Hopei and under whose direction Caterpillar road building machines made the demonstration, estimated that it would require on thousand Chinese coolies to do the work that was done by the one machine and that the machine finished road was much superior to that done by hand labor. In comparing costs he demonstrated that the machine-made road to be about one-sixth of that of hand labor. The opinion was advanced that a Provincial Highway Department could rebuild and refinish with modern machinery its existing highways and make them so inviting to vehicular traffic that the increased revenue derived therefrom would enable the Department to purchase additional machines for the more rapid extension of its highway system and that after a few months would find itself in the enviable position of being self-sustaining and able to complete its entire Provincial road building program without the assistance of any funds from outside sources.

Due to the constantly increasing realization of the value of highways for the rehabilitation of the general economics of the country, many agencies are more active than ever toward affecting actual accomplishments. Among these are; International Famine Relief Commission, Provincial, Military and Civil Governors, and private bus line interests.

Automatic Telephones in Japan

(Continued from page 548).

It strongly absorbs the moisture of air at an ordinary temperature without any change in itself and can be used permanently. At 120° C or above it expels the absorbed moisture and when cooled it becomes capable to absorb the moisture again. Acid earth is composed chiefly of silicio acid and aluminum and absorbing power of adsole is over 15 per cent. of its own weight. Completely dried air can be obtained by sending the moisted air through a tank containing adsole. When the dried air is moistened by spray, the air becomes cool through the evaporation. This process enables us to obtain refreshed cool air in summer.

Two adsole tanks are provided in one plant. One is used for drying the air and the other will go under recovery of adsole by using the hot air steam with 200° C temperature. The heating device for drying the wetted adsole is used also for heating in winter time. So with adsole equipment it is also possible to get cool in summer and warm in winter in addition to drying air.

Telephone Sets and Dial.—The same transmitter and receiver as used by C.B. manual subscribers are also used in the automatic subscriber. The talking current supply coil in S. H. equipment is modified to sufficient talking current to this transmitter.

At first B. P. O. No. 8 type dial, B. P. O. No. 10 type dial and S. H. type dial were used. Afterwards as we conceived B. P. O. No. 10 type dial is superior to No. 8 and A. E. L. No. 24 type dial is robust and perfect, only these two types of dial shall be used in future.

The normal speed of dial impulse is 10 per second and impulse ratio is two open to one make (allowable limits are from 1.7 to 2.3 open to one make.) The minimum pause is more than 0.65 second for B. P. O. No. 10 dial and 0.35 second for No. 24 dial.

Arrangements against Earthquakes.—Not only the arrangements against earthquakes and fire were made for the buildings but also for the equipments in the automatic office. All switch boards are specially designed against earthquakes and all boards and racks are tied together with angle iron to resist the vibrations due to earthquakes. The same cares are taken for battery equipments. The buildings are of double window construction and the switching rooms have double doors to make them dust proof.

The equipment of Mikage and Ashiya offices are automatized with Siemens Brothers' No 16 equipments. The offering in toll connection is done by toll connecting switch and the ringing to the called party is controlled by the toll operator.

Toyko's Street Paving Program

(Continued from page 557).

Mr. Hidekichi Kamiya, director of the road construction section of the municipal government, in a recent interview with a representative of *The Japan Advertiser*, said:

"An investigation conducted by the city revealed that the average motor car owner saves about Y.300 on one car if he operates it on surfaced streets. There are about 20,000 automobiles in Tokyo now so the saving would amount to Y.6,000,000.

"We would like to pave the remaining streets in the city area with concrete but that is entirely too expensive a proposition for the city to undertake at the present time. However the asphalt pavement is quite efficient and we have conducted experiments which indicate that it will be feasible to maintain that type of surfacing on streets less than 36 feet wide, which would include virtually all of those now unpaved. The asphalt emulsion paving method was worked out by experts of the road construction section and the Tokyo Municipality holds the patent rights for it.

"The cost of the paving under consideration will come to about Y.10,000,000. Under the present plan the city would appropriate about Y.2,000,000 annually for paving 250 acres of streets and keeping up those which already have been paved."

Mr. Kamiya estimated that paving since the earthquake has cost the city approximately Y.70,000,000, or about Y.30 per tsubo. The rest of the streets can be paved with asphalt for about Y.4 per tsubo and it will cost about 60 sen per tsubo each year to maintain them.

The asphalt is applied to a well rolled ballast set in the roadbed under the Tokyo method. In some sections of the city the ground is so hard that very little ballast will have to be laid, thus cutting expenses still further. Another advantage of the asphalt under present circumstances is that it is easily torn up and the break repaired, which will prove a convenience when sewers or other subterranean conduits have to be laid. At the present time the asphalt pavement in the city amounts to about 120,000 tsubo.

Atlas Cement's New Official

His old friends in the Orient, will be glad to hear of the appointment of Paul C. Van Zandt as an additional assistant to the president, of the Universal Atlas Cement company, a subsidiary of the United States Steel corporation.

Mr. Van Zandt has had thirty years' experience in the cement manufacturing field in the United States, Canada, Mexico, Cuba and the Orient. For five years he was chief engineer for the Asano Portland Cement company, Tokyo, which has a daily capacity of 160,000 sacks. He built and started operation of five cement plants in Japan, designed, erected and started in operation five waste heat power plants and changed cement shipments in the Japanese empire from wooden barrels to sacks. He originated and trained a corps of Japanese engineers to operate American cement machinery. At that time Mr. Van Zandt was the only American cement plant engineer in the Orient and his duties involved work with every plant of consequence in Japan and China.

Prior to his experience in Japan he was connected for eighteen years with the Allis-Chalmers Company, designing and remodeling cement plants, correcting difficulties in operation and increasing their efficiency. During this period he visited leading cement producing countries throughout the world.

Mr. Van Zandt invented the Compeb double grinding cement mill known for its simplicity and economy which pulverizes in one operation raw material or cement clinker from one-inch size to impalpable powder.

For the last six years Mr. Van Zandt was connected with the Ideal Cement company during which time he built two new plants and remodeled two others.

Mechanical Stokers in Modern Steam Power Plants

By F. OBATA

THE trend towards larger turbine-alternator units and larger boilers in an attempt to lower the initial investment in generating stations is paralleled by higher initial steam pressure and temperature in order to secure higher efficiencies.

The largest turbo-generators of 50,000 to 75,000 kw. rating of a few years ago are now outclassed by the still larger units of 160,000 to 208,000 kw. rating of the present day. Increase in boiler sizes has kept pace with the turbo-units, and the unit capacity has jumped within the last few years from hourly evaporation of 100,000 lbs. to 300,000 lbs., and in an exceptional case even to 1,250,000 lbs. The maximum practical steam pressure of yesterday of 500 lbs. is superseded to-day by still higher pressures of 1,200 to 1,400 lbs. with total temperature of 750 deg. F. with increase in the size of the units, improved designs, higher steam pressure and temperature has come betterment in plant efficiency. A record of a few years ago of 18,000 B.T.U. per kilowatt-hour from coal pile to the generator terminal is now broken by the present day super-power station, where one finds the highest record of 12,500 B.T.U. per kilowatt-hour, with several plants averaging 14,000 B.T.U. per kilowatt-hour. Still higher economies are obtain-



Fukusaki Steam Power Station of the Ujigawa Electric Power Company at Osaka

boiler plant efficiency of as high as 90 per cent. is now considered possible with improved boiler and furnace design, and better combustion equipment with proper heat recovery arrangements. Combustion engineering is a fertile field for the engineers of to-day, for combustion equipment performs an important part in the modern boiler room. Of various methods of firing, the underfeed type stoker plays a prominent rôle. Underfeed stokers can be built to-day up to 800 sq. feet projected grate area and over, with an hourly minimum capacity of 50,000 lbs. of coal. This type of stoker is extremely flexible in its performance, and has a flat efficiency curve over a wide range of load conditions. Its quick response to meet instant high peak load, makes this type of stoker highly adaptable to power stations with fluctuating loads with steep peaks.

It is therefore quite natural that this type of stoker found its way into Japanese steam power stations, where load fluctuations are extremely severe. Typical underfeed stokers installed in Japan were furnished by Riley Stoker Corporation. Riley underfeed stokers are installed in four large central stations and two mining and one paper mill plants, aggregating 484 retorts representing 10,156 sq. feet projected grate area. The combined combustion capacity of these Riley stokers is equivalent to 250 tons per hour, and on an assumed basis of 50 per cent. yearly load factor, 1,100,000 tons of coal could be burned on these stokers in a year. With coal at Y.15.00 per ton, the coal consumed by these stokers represents a total



Kizugawa Power Station of the Ujigawa Electric Power Company at Osaka

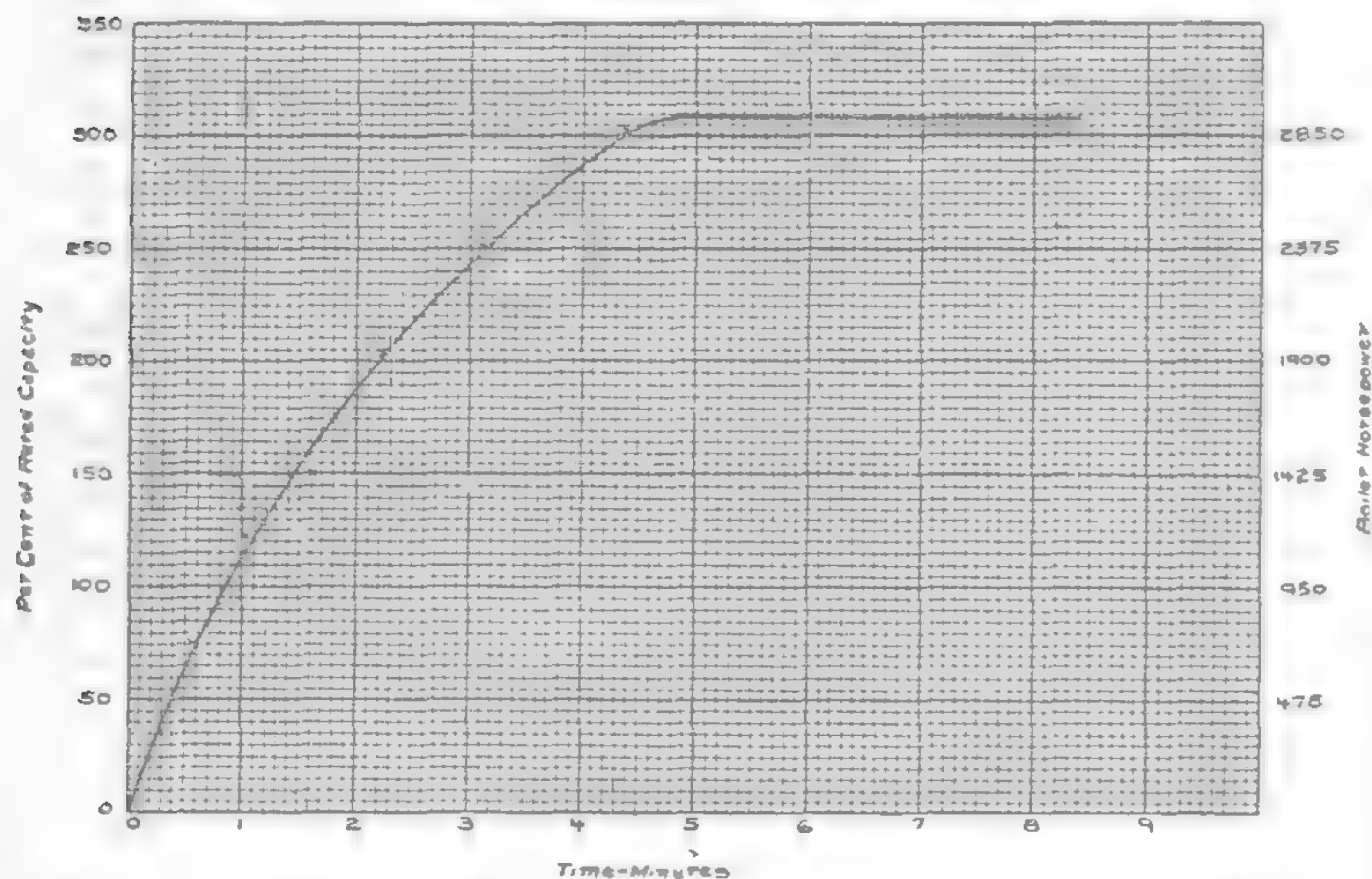
able by using mercury in a binary vapor system, indicating the practical possibility of producing kilowatt-hour at 10,200 B.T.U. A kilowatt-hour production at 18,000 B.T.U. represents 19 per cent. overall efficiency, whereas a kilowatt-hour at 12,500 B.T.U. means 27.3 per cent. efficiency. In terms of coal, say at 12,500 B.T.U. per pound, the coal consumption has decreased within the last several years from 1.44 lbs. per kilowatt-hour to 1 lb. per kilowatt-hour. This reduction in the coal consumption was effected by improved efficiencies of the power plant equipments and better plant design. Improvement in the steam turbine efficiency referred to Bankine cycle within the last few years, was noted to be from 78 per cent. to 82 per cent. and the betterment in the generator efficiency from 97 per cent. to 98 per cent. whereas the overall boiler plant efficiency has jumped from 75 per cent. to 85 per cent. The comparatively smaller margin in the improvement in the turbine-generator efficiency is accounted for by the fact that the best engineering brains have been applied to its design for many years, and it has been long nearing the highest stage of development. The present turbo-generator efficiency leaves very little room for further improvement. Whereas the boiler room, in spite of the marked strides in efficiency within the last few years, still holds possibilities for further improvements. An overall



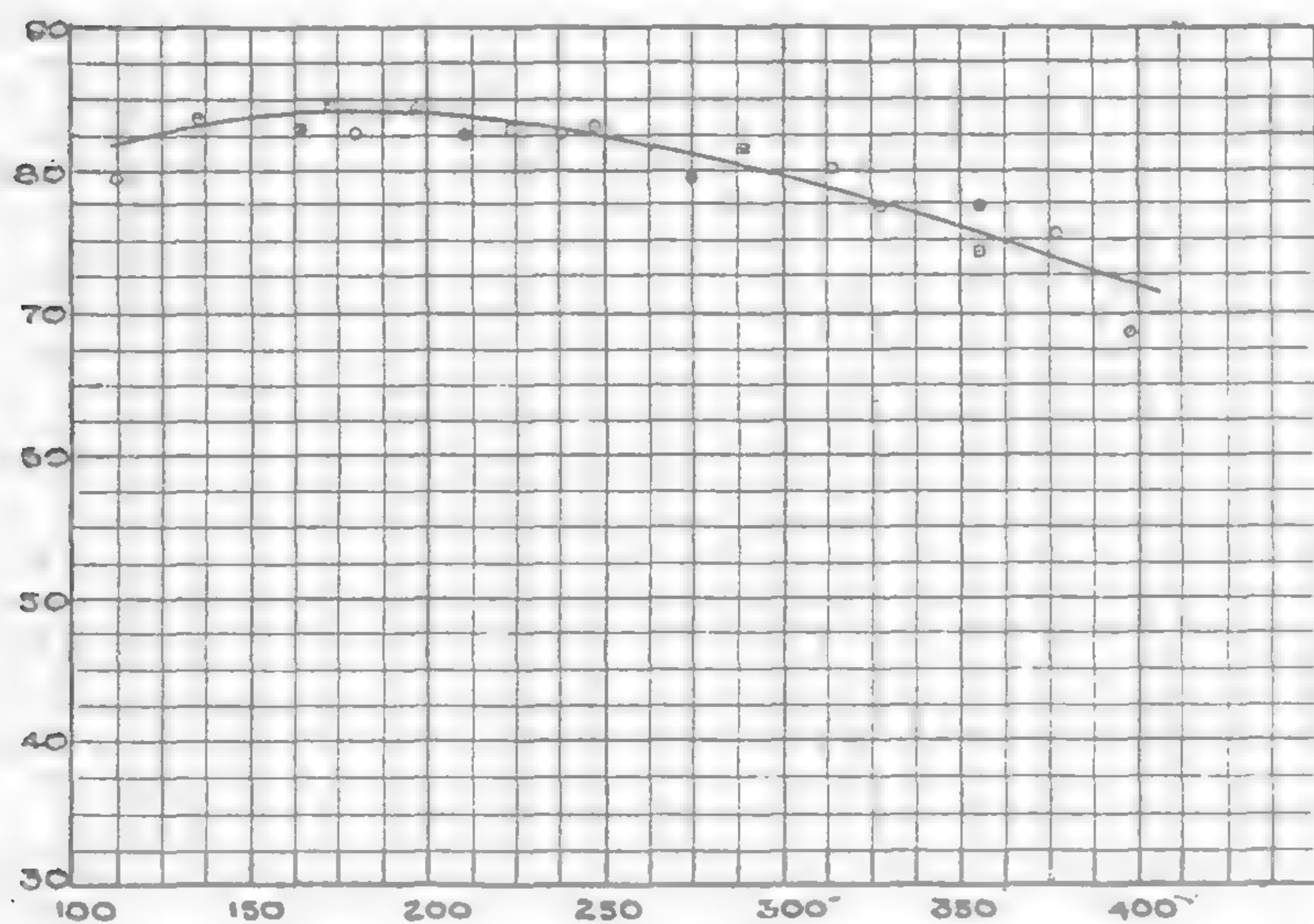
Amagasaki Steam Power Station of the Nippon Electric Power Company at Osaka

value of Y.16,500,000.00 per year, whereas the initial total cost of these stokers was some Y.1,000,000.00. From this it is evident that a few per cent. saving in the fuel due to higher combustion efficiency of these stokers will wipe off their initial cost in the course of a few years. The most interesting installation of Riley stokers in Japan is found at the New-Kizugawa Steam Power Station, of the Ujigawa Electric Power Company located in Osaka. In this plant, there are eight Riley underfeed

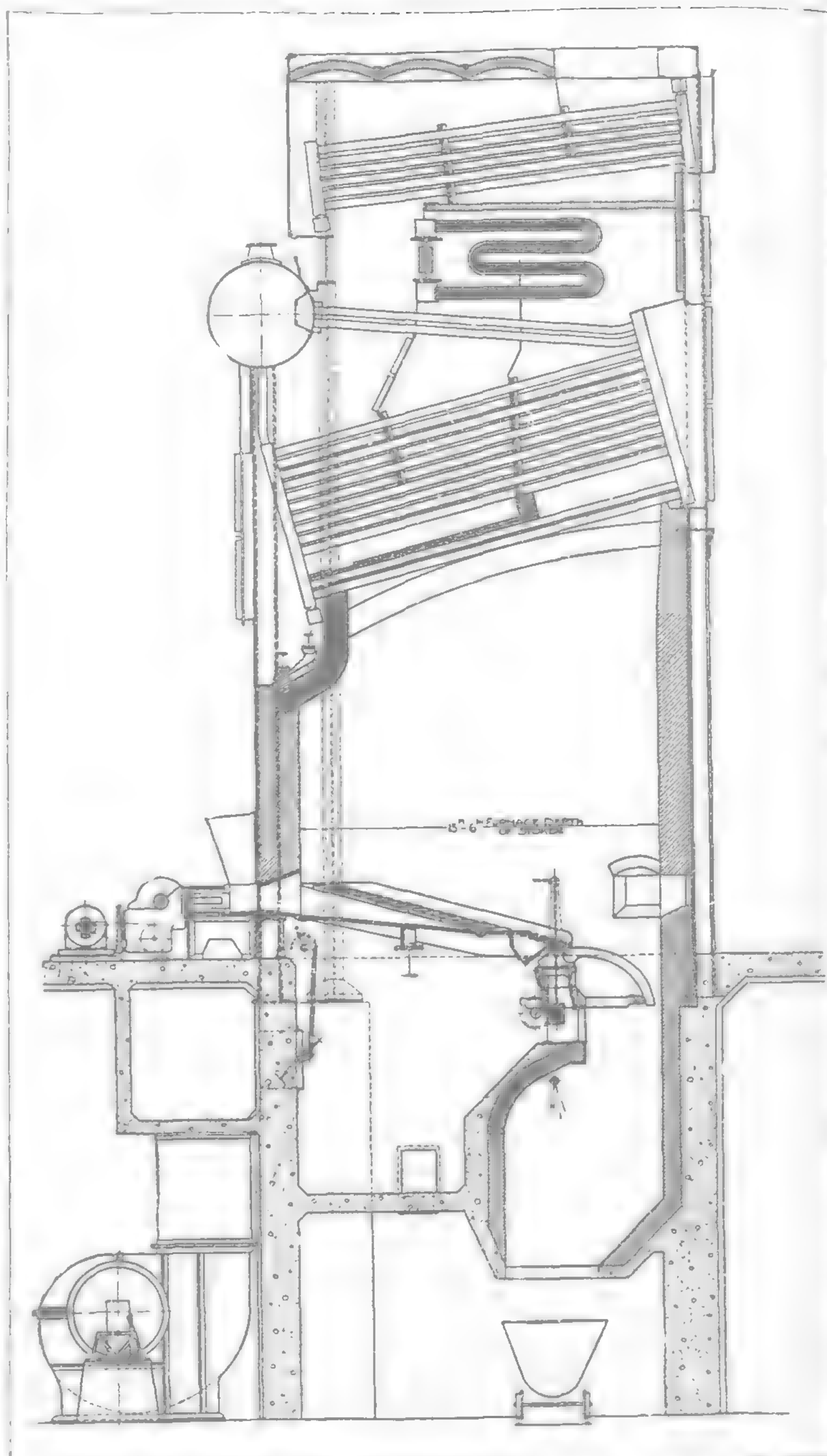
stokers, each 20 retorts wide and 16 feet -0 inch long, representing 4,056 sq. feet total projected grate area. These stokers represent three repeat orders. The Riley stokers furnished this company
(Continued on page 585).



The curve above is plotted from a test by G. H. Perkins, Consulting Engineer, to show how quickly a boiler could be brought from banked fire to 300% rating. This was accomplished in 4 mins. 23 secs. on a 950 H. P. Heine boiler fired by a 10 retort Riley Stoker



A composite efficiency curve of four Super-Stoker installations. Efficiencies are without air preheaters, economizers or water walls



13 Retort Riley Super-Stoker Applied to 1080 H.P. B. & W. Boiler for the Nippon Electric Power Company.



Riley Stoker Installation at the Amagasaki Power Station of the Nippon Electric Power Company, Osaka



One of the Riley Stokers at the Kizugawa Power Station of the Ujigawa Electric Power Company, Osaka

Oil Refining in Japan

As civilization and mechanical development progress, it becomes more and more evident that petroleum and its numerous products are quite essential to the happiness of mankind. Realization of the important part being played by petroleum has induced prospecting and drilling for oil in countries throughout the earth.

The production of petroleum is in contrast with the production of coal and many other materials taken from the ground in that the raw material bears such a slight semblance to the finished products which are useful. Much processing, based on scientific knowledge and research, is needed before the crude oil can take its place in the various markets and sold to retail buyers.

Another characteristic which should be borne in mind is that the useful products of petroleum are difficult or dangerous to transport as compared with the crude oil and it, therefore, is often better to carry the crude oil from the source of production to the point of use for refining than to refine it at the point of production and transport it thousands of miles with consequent loss through evaporation, depreciation, and from a certain percentage of accidents which would be inevitable due to its highly inflammable character.

An instance of how such an arrangement of transportation and refining has proven of great benefit to Japan will be of interest to readers of the *Far Eastern Review*. Japan, it will be understood, must purchase crude oil from foreign sources and, because of the high cost of transportation, it is desirable that the refining should be done close to home. It is, further, important that the refining be accomplished in the most up-to-date equipment in order that maximum yields of finished products be available at minimum operating expense.

The Nippon Oil Company Limited at Kudamatsu, Yamaguchi Ken, Japan, has recently put into operation a two stage distillation unit designed for the refining of California crude oil. By a two stage unit is meant a refining unit in which there are two oil stills for vaporizing the crude oil and two fractionating towers for separating the vapors of the different products. One of these towers operates at atmospheric pressure and the other under a vacuum of about 28-in.

The rated capacity of this refining plant is 2,500 barrels of crude oil per day, and referring to the accompanying diagrammatic flow chart, the performance is approximately as follows:

Crude oil is taken from storage tanks and pumped through the heat exchangers on both stages and is then led into the atmospheric tube still. The temperature is raised sufficiently to obtain the desired vaporization. The oil and vapors are discharged from the still into the atmospheric fractionating tower, which is capable of continuously recovering gasoline, naphtha, kerosene, and gas oil.

The reduced crude bottoms from the atmospheric stage amounting to approximately 50 per cent. of the original charge are pumped, hot, to the tube still of the vacuum stage, where they are further heated before being introduced into the vacuum fractionating tower.

The low absolute pressure at which this tower operates reduces the boiling point range on all of the products, thereby permitting the heavier fractions to be vaporized at temperatures below which thermal decomposition would be of serious consequence.

This tower continuously recovers gas oil, wax distillate, heavy wax distillate, overhead cylinder stock, and an asphalt bottoms to penetration specifications.

Exhaust steam from the pumping equipment is passed through superheaters located in the settings of each still. This superheated exhaust steam is used in both towers and permits bringing the various products to more rigid specifications than would otherwise be possible.

Fuel consumption is well under 3 per cent. of the thruput and if the plant should be run to lower percentage vaporization, a considerably greater quantity may be processed with a decrease in the fuel consumption per barrel of thruput.

The unit as installed is complete with stack, condensers, heat exchangers, barometric condenser and steam jet vacuum pump. It was designed and installed by the Foster Wheeler Corporation of New York City and formally accepted March 30, 1930. The operation is under precise supervision, the plant being equipped with electrical recording meters for temperature and pressure, liquid level indicators, vacuum indicator, flow controllers, and back pressure regulator, in addition to the usual indicating and recording gauges and thermometers.

The illustrations give a good idea of the quantity of equipment involved, the size of the pieces and the intricacy of the installation. To transport this material into a foreign country and place it in satisfactory operation presents many interesting problems and, inevitably, some which are unexpected. The methods used and the equipment available vary quite considerably in different countries. In this case all of the labor was secured locally and consisted of that available in an outlying district of Japan. The refinery is about 400 miles from any large city. A competent superintendent was sent to Japan for the purpose of

supervising the erection work and checking all construction to make sure that it would function properly when ready for service. The handicap of erecting under a different language and different traditions was overcome and the plant, as finally completed, is an excellent example of up-to-date refinery practice as employed in the United States.

Both stages of the unit have been designed with unusual excess capacity for the reason that it may be called upon later to handle different grades of crude oil. At the outset it was intended to refine California crude of a paraffine base but if this should later on be changed to a naphthenic base crude, the design of the unit is such that provision has been made for taking the various fractions necessary to secure the greatest quantity of high grade marketable products from a wide range of petroleum crudes.



Two stage refining unit as erected in Japan after shipment from United States. This picture shows the vacuum tower on the right, the stack in the center background, and the atmospheric tower at the left. The low building with windows is the pump and receiving house



View of the Vacuum tower of the Nippon Oil Company showing stack at the right and the two tube stills in the lower right-hand corner. This picture well illustrates the quantity of equipment required for a first class installation and gives a good idea of the engineering work necessary to insure its successful performance



This illustration shows the completed refinery installation from the front of the tube stills. The compactness of the equipment is worthy of attention since the arrangement in conjunction with proper instructions for operation make it possible to run the unit with very few men



85 ft. vacuum bubble tower at the Nippon Oil refinery. In the foreground will be seen two winches operated by hand. There are eight men on each side of each winch making 32 men used for lifting the tower into position



Atmospheric tower and tube still showing vapor line from the top of the tower down to the condenser. This shows the accessibility afforded by the single steel framework between the towers. Suitable stairways provide ready access to all parts of the towers, and platforms give ample operating space

The great care with which the engineering details had been worked out in America in order that all possible difficulties would be overcome when the equipment arrived in Japan, was evidently appreciated by the Japanese refinery engineers. They co-operated most wholeheartedly in the construction work with the result that good speed was made in completing the plant and all engineering problems were worked out in a mutually satisfactory manner.

A brief description of the equipment included will perhaps indicate more forcibly than anything else just how wide a range of construction work was necessary to complete the installation:

Two tubular oil stills having complete steel framework, fire brick, and red brick settings, steel roofs, ladders, platforms, and including a steam superheater, were necessary for heating the oil. These stills were built so that they could be fired either with oil or with gas.

The atmospheric fractionating tower was about 75 feet in height and nearly six feet in diameter. It was equipped with bubble trays and stripping sections, all of which had to fit perfectly to provide successful operation.

The vacuum tower was about 85 feet high by almost 10 feet in diameter and it also was fitted with many internal trays, baffles, and stripping sections.

The heat exchangers included two having 936 admiralty mixture tubes, one having 92 one inch seamless steel tubes, a final condenser having 1,000 square feet of cooling surface made up of admiralty tubes, a wax distillate cooler of 350 square feet surface, a heavy wax distillate cooler of 125 square feet cooling surface, a cylinder stock cooler of 350 square feet, and a residual cooler of the same size.

Barometric condenser and steam jet air pump for maintaining the vacuum on the vacuum tower were also provided.

Gravity Type Filters for Japan

IN our issue of January, 1930, we published the details of an important contract placed by the Imperial Steel Works, Yawata, Japan (on the Island of Kiushiu), with a British firm, for a very large rapid gravity sand filtration plant for the water supply.

We now learn that the Imperial Steel Works have recently placed a similar important order, also with a British firm.

The Candy Filter Company, Ltd., of London, have received an order for a plant with a capacity of 40 cubic metres per minute, or 12,662,000 gallons per 24 hours, and are supplying the "Candy" Gravity Type Filters consisting of eight units of just over 1,500,000 gallons per 24 hours' capacity each, the filter tanks being constructed of concrete.

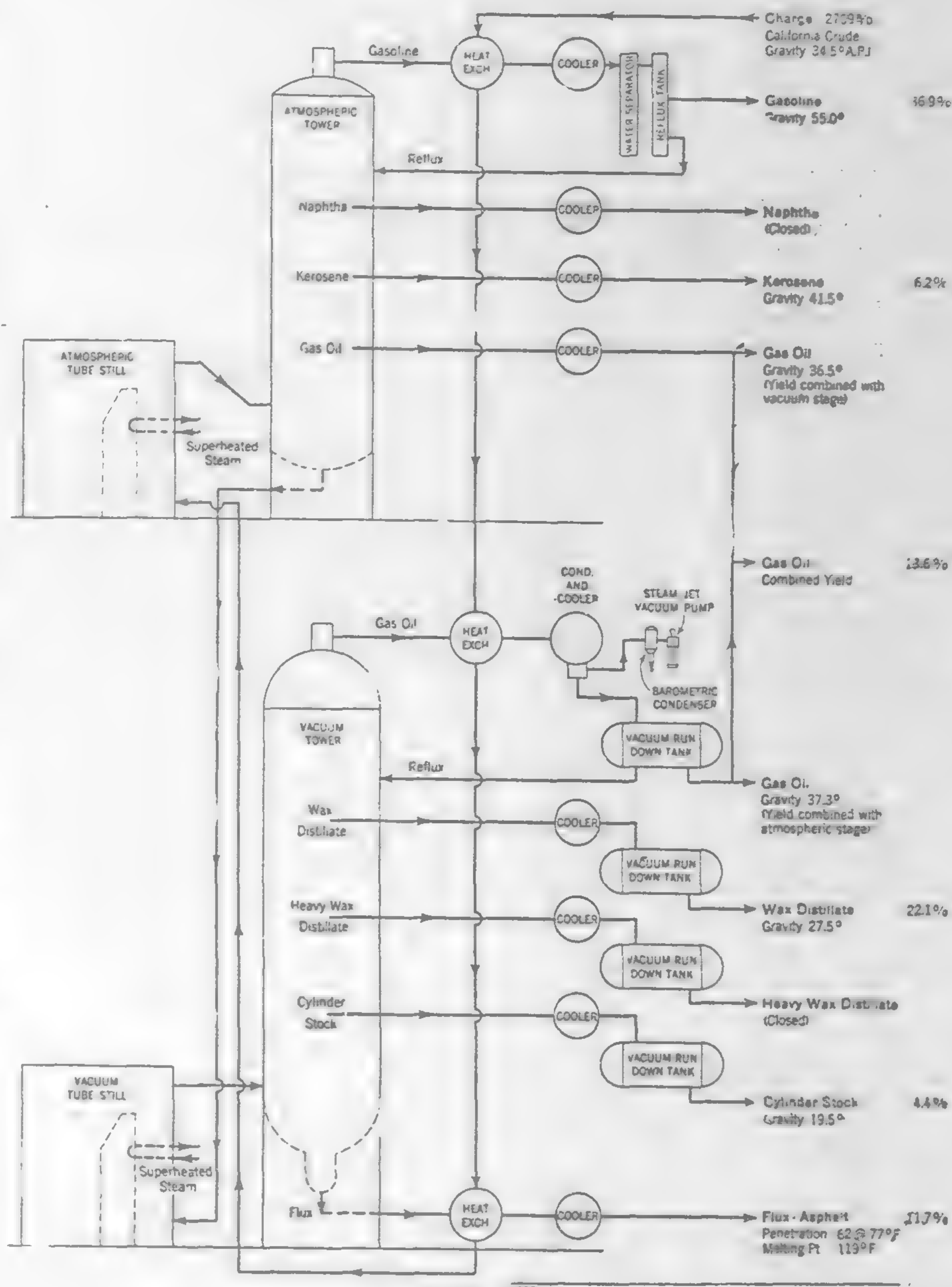
This is one of the many plants installed by the Candy Filter Company in Japan, among which may be mentioned that at Kobe, which has a capacity of 16 million gallons per day; while amongst recent orders received by the firm is one for Tobata with a capacity of 2½ million gallons per day.

Largest Power House in Manchuria

NEXT month, the largest power-house in all Manchuria, erected at Takuantun, Fushun, the seat of the world famous Collieries, at the outlay of altogether Y.3,700,000, will be ready for operation.

In the new power house, two generators, each of 25,000 kilowatts, with three boilers, each of 1,500 horse power, are installed.

When the new power house is ready, the total generating capacity will be 58,000 kilowatts.



Flow Chart of Foster-Wheeler Installation for the Nippon Oil Co.

There are at present, besides the new one, three 3,000 kilowatt generators in addition to one 1,500 kilowatt generator installed in the Mond Gas Producers Plant, but, owing to the progress of the underground mining of the Oyama Shaft, the ground on which this power house stands is gradually giving way, threatening a cave-in at an unexpected moment.

Again, in the third power house, there are two 12,500 kilowatt generators and one 5,000 kilowatt generator.

As more electrically-driven shovels are installed at the Kun-chengtzu Open Cut Mine, and since all the steam locomotives are to be replaced with electric locomotives at Fushun, not to mention quite a large amount of power which will be needed for pumping up the natural flow of subterranean water in the existing shafts and pits as they are excavated deeper, the Fushun Collieries management will have to provide itself with at least 55,000 kilowatts for Fushun alone.

Hence, the construction of the new extensive power house.

As to the power house attached to the Mond Gas Producer Plant, the 3,000 kilowatt generator only will be retained for the Plant's own use.

We might add that one of the two 25,000 kilowatt generators in the new Power House is to be kept as a spare, to provide against emergency.

As matters stand, the Fushun Power Houses will be capable of supplying the needs of as far north as Ssuningkai, including Mukden, Tiehling, Kaiyuan, etc., and as far south as Anshan, inclusive of Yentai, Liaoyang, etc. In such event, the residents of all minor stations that intervene will be enabled to share the benefit.

Electricity in Tea Factories

DURING the last decade, the advantages accompanying the use of electricity for power and lighting have been generally recognized by the managements of the Javanese tea factories.

Simple attendance and little supervision required by electrical installations, as well as the fact that such plants can be readily extended are the chief motives in favor of electrification. If the scheme is required for a new factory with suitably selected drives, the advantages offered can be more fully utilized than when the work has to be effected in existing plant equipped with machines which have already become obsolete.

If it is possible to obtain supplies from a public distribution network and the private power station which frequently exists can be retained as a stand-by the advantages of extensive electrification assume a very prominent position.

In West Java, the factories frequently lie far in the hinterland and are therefore outside the area supplied by electricity companies. Connection to public distribution systems would only be accomplished in such cases with considerable canal outlay, hence preference must perforce be bestowed upon the installation of a private power station.

The prime movers permit a choice between crude oil engines and hydro-turbines only. In Java, crude oil is cheap, while other fuels such as wood and coal incur heavier transport costs or usually they are not available. The small space required by the Diesel plant and the simplicity with which the fuel may be stored are deciding points in the choice of such installations. Tea factories are generally situated in mountainous districts, hence water power is frequently at hand. A fairly large number of hydro-power plants have been installed, even in districts within the

provinces of electricity companies, but in such cases new concessions are only granted by the government when proof is given that the costs of a private station are less than those arising from connection to the public supply system.

The present article gives a short description of the new Sambawa Tea Factory, Broedjoel.

The "Sambawa Estate" Company owns a fairly old factory in which the tea from their own plantation is prepared. The new factory is principally intended for handling the tea cultivated by the native planters. The management of the old factory effected propaganda for many years in order to persuade the surrounding inhabitants, who are almost all in possession of plots of land, to plant tea. As all the land surrounding the company's tea garden was in possession of the natives, and further extensions of the garden were excluded, this constituted

the sole method by which production could be augmented. Until a short time ago, the local planters brought their tea to the old factory. The tea producing district grew to such an extent that finally the distance to the old factory was so great that a considerable portion of the tea was no longer sent to the factory. Conditions thus necessitated the erection of a new factory near the center of production.

The choice of site was difficult as the surface in the mountainous district sloped up to the critical angle everywhere. On one occasion it was necessary to re-start work on a new site after expensive excavations had been dug and foundations laid, because an extensive landslide annihilated all the work that had been effected.

For the present, it has been decided to generate current at the factory. Connection to the public supply mains is planned for the future when the



Fig. 1.—General View of the Tea Factory and the Power Station on the Left



Fig. 4.—Individual Flange Motor Drive of a Tea Roller



Fig. 2.—Power Station

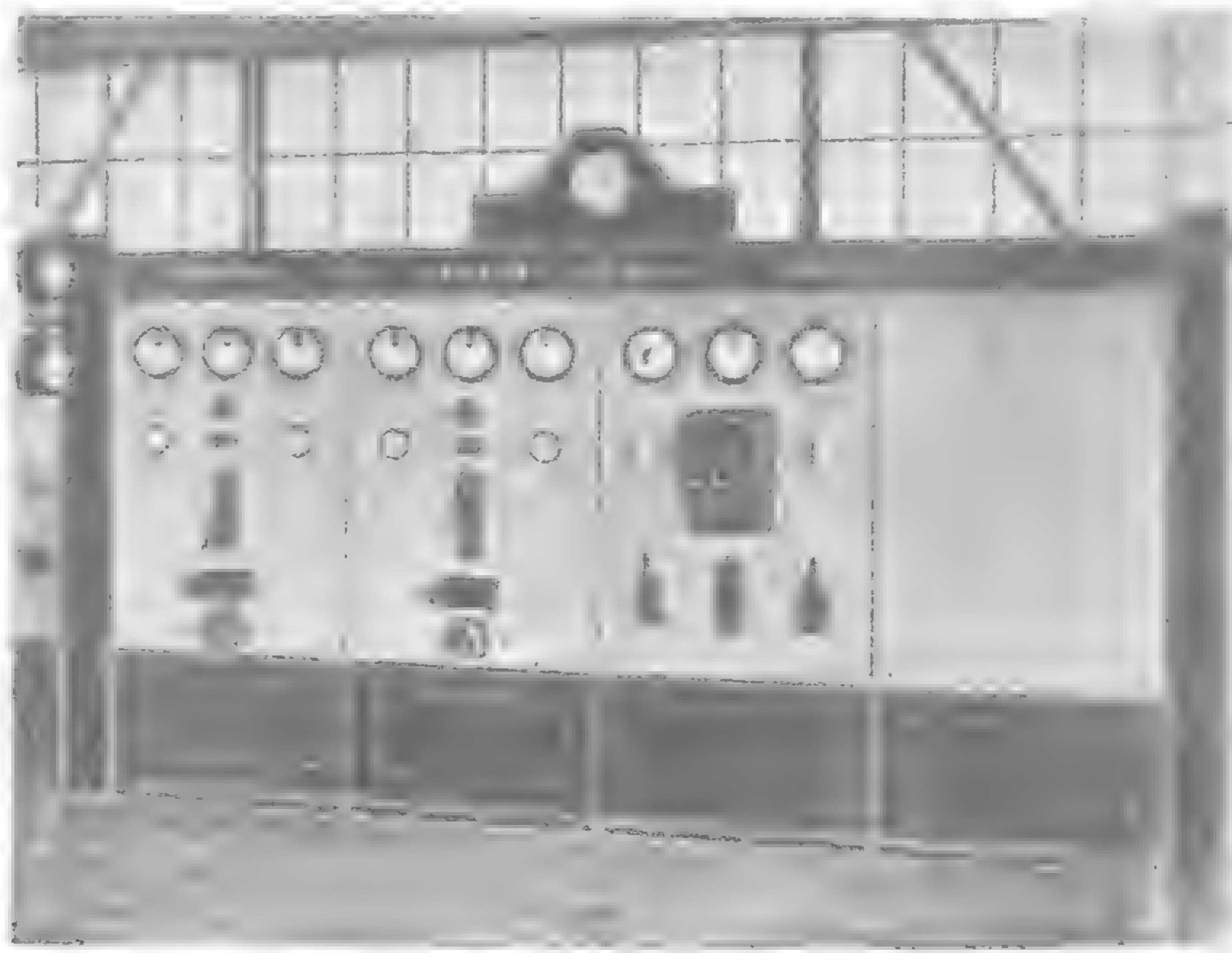


Fig. 3.—Main Switchboard in the Power Station



Fig. 5.—The Roller Department, Tea Rollers on Left, Tea Bale Breakers and Sieve Machinery with Individual Drive on the Right

network approaches the vicinity of the factory and the cost is no longer prohibitive as it is at the present time owing to the distance. Access to the new factory is very difficult and a new road had to be cut and many bridges reinforced to permit the transport of material.

As neither wood-fuel nor water power was available, a Diesel installation had to be employed. This plant was installed in a separate building, thus the generating plant and the tea factory were completely separated, the exhaust gases kept away from the factory and cleanliness in the neighborhood of the tea rooms was greatly enhanced.

Fig. 2 reproduces the interior of the power station; two Diesel sets are installed, each being for 120 h.p. at 300 r.p.m. The engines are of the Sulzer solid injection type. At the present time, one of the sets acts as a stand-by. A synchronizer for parallel running has been provided. The Tirrill regulator can be switched over to either set. Fig. 3 shows the main switchboard in the power station. The blank panel will be employed as soon as connections are made to the public mains.

The separate erection of the Diesel plant automatically excluded the possibility of driving the tea machines by way of line shafting from the Diesel, hence only electric drive with its overall efficiency of 75 per cent. could be employed. It was therefore imperative to design the electric motor drives so that the generating costs for the current were a minimum. Efforts were also made to promote cleanliness in the factory, and where economically possible the use of line shafting and belting was avoided.



Fig. 6.—General View of the Assorting Room with Two Sulzer Fans Coupled via Spur Gearing with AEG-Motors. Switch Panels Between Both Fans

Calculations showed that individual motor drive for the tea machines offered saving in current consumption over that possible from group drive, particularly so if high-speed motors with good efficiency and power factor were chosen so that each motor ran with loads of from 90 per cent. to 100 per cent. of its rated load.

The AEG flange motor geared drives enabled the conditions to be satisfactorily fulfilled for even the low-speed tea machines. Individual drive could be rationalized throughout the entire factory, and the tea rollers, bale breakers, fans etc., were all provided with their geared drives. Only the tea dryer and a few special machines, which are generally built for belt drive, were not directly coupled.

Double-cage motors were exclusively employed; these motors are started by way of star-delta starters. It is therefore particularly simple to set all the machines in service. An ammeter is built onto each starter, hence permitting the load on each motor to be checked.

Fig. 4 shows a tea roller complete with drive. The gear shaft is flexibly coupled to the roller shaft which runs at 80 r.p.m. Initially, no information was available as to the starting torque of the roller. Centrifugal couplings cannot be manufactured for such low speeds; the starting torque available was therefore 0.7 of the full-load torque, as the current rush on starting was not to be allowed greater than that of a slip-ring motor.

It was subsequently disclosed that the starting torque was not excessive, and that the initial current remained less than 1.5 times the normal rated current. When star connected, the motor almost attains its normal speed within a few seconds. The inertia of the roller may be considerably great, but its low speed (40 r.p.m., ratio 1.2 between roller shaft and rotating roller trough) is the reason why it assumes but little kinetic energy. It is therefore unnecessary to calculate on more than half-load starting torque, a driving power of 4 to 5 h.p. sufficing.

Fig. 5 shows a section of the rolling department. The comprehensive lay-out and cleanliness realized in this case through the avoidance of shafting and belting will immediately attract the attention of all those who have inspected numerous other tea factories. A bale breaker with drive is to be seen in the foreground on the right.

The frontispiece shows the three electric fans in an extension on the first floor. Spur gear drives have also proved effective in this instance. The fans are of Messrs. Sulzer's make and are especially well adapted to their duty and show good performance and high efficiency. They draw a mixture of external and warm air from the tea dryers through a pipe system. The saturation of the air increases by a few percent, so that water is extracted from the tea leaves. About 40 per cent. of the water must be dispersed in the extension.

Fig. 6 shows the assorting department. The electric fans in the background draw off the dust arising from the assorting of tea which is effected manually and mechanically. The tea trough which assorts pneumatically is situated on the right. A fan, which is driven by a variable speed motor, is mounted at the end. Direct-coupling could not be used here on account of space. A belt conveyor transports the tea from the hopper up into the trough room where it comes into contact with the current of air. On the left may be seen an assorting machine which assorts mechanically and which is a patent of a local workshop. The large open space in the middle of the room is used for manual assorting. A large number of women sit on the floor, and by throwing up the tea which is spread out on a large plate-shaped mat, very skilfully separate the fine particles of tea from the coarse. The ironclad distribution plant may also be seen in the background.

Both power and lighting distribution gear in the entire factory is executed in cast-iron enclosures. Unfortunately no illustration is available of the main power and lighting distribution plant. It comprises nineteen panels and has a total length of about twenty-three feet.

Fig. 7 shows the ample illumination of the factory. Concentrators with very powerful lamps are installed in the assorting room in order to provide a concentrated illumination for sorting the tea by hand at night.

This establishment is regarded by the Javanese to be a model factory, and so it is the object of much interest to tea concerns desirous of erecting new factories. Several new tea factories which are practically a copy of the Sambawa factory, Boredjoel, have already been planned.

A. LEVIN.



Head Office of the Industrial Bank of Japan, Tokyo

Japan's Special Bank for Industrial Financing

Industrial Bank of Japan is Country's "Credit Mobilier"—Makes Loans on Securities and Mortgages—Aids Small Borrower—Assists Japanese Industry in China

HERBERT M. BRATTER, *Finance and Investment Division, U. S. Department of Commerce*

IN 1900 a law was passed in Japan providing for the organization of a bank along the lines of the Credit Mobilier, to advance long-term funds on the security of movable property. Two years later, in March, 1902, the Industrial Bank of Japan (Nippon Kogyo Ginko) was established, under Government control, as a joint-stock company with a 50 year charter and an authorized capital of Y.10,000,000 one-quarter paid up.

Designed Primarily for Long-Term Loans to Industry

The bank was designed primarily as an institution to furnish industry with long-term loans on such security as national, prefectural or municipal bonds, company debentures and shares, mortgages of estates, and land and buildings. It also was permitted to discount bills, engage in trust business, make loans to public bodies organized by law, and receive deposits. To raise funds for these various operations, the Industrial Bank was granted the power to issue debentures not exceeding 10 times the amount of its paid-up capital, such total—including internal and external debentures—being limited further to the amount of outstanding bank loans, discounted bills, national and municipal bonds, company

debentures and shares owned (taken at their market value), and gold and silver held by the bank.

In order to assist the Industrial Bank in its initial activities, the Government undertook to guarantee a 5 per cent. return on the bank's shares for the first five years. According to the Japan Year Book of 1924-25, the Imperial Government guaranteed "profits for investments made abroad, within the limit of Y.100,000,000."

External Loans Floated

Apart from its function of aiding in the distribution of loanable capital within Japan, the Industrial Bank was designed to bring foreign capital into the country at favorable opportunities. Its first external loan was an issue of £2,000,000 of 5 per cent. debentures, floated in England and France in 1908 at 97. In August, 1924, an issue of 6 per cent. notes was offered in New York at 99½, to mature in 1927. The amount of the issue was \$22,000,000, bearing the guaranty of the Japanese Government.

Not only has the Industrial Bank issued its own external debentures, but it also has assisted in the flotation of other Japanese loans abroad. Thus, it issued in London the sterling debentures of the South Manchurian Railway of 1907, 1908, and 1911. In

1926 the Industrial Bank aided in the issue of a £6,000,000 loan in London for the city of Tokyo, and a loan of \$19,740,000 in New York for the city of Yokohama.

Early in the history of the bank foreigners owned no small portion of its shares, and the Japan Year Book of 1924-25 stated that they held Y.7,500,000 of the capital.

Present Activities of the Industrial Bank

The Twenty-Eighth Financial and Economic Annual of Japan gives the present functions of the Industrial Bank as follows:

1. To make loans on pledges of national and local bonds and companies' debentures and shares.
2. To subscribe for or take up national and local bonds and companies' debentures.
3. To receive deposits of money and accept articles of value for custody.
4. To engage in trust business for mortgage debentures.
5. To discount bills.
6. To engage in the business of bills of exchange.
7. To make loans on security of foundations created as prescribed by law.
8. To make, on mortgage of ships or ships under construction, loans which shall be redeemable by annual installments within a period not exceeding 15 years, or at a fixed term of not more than 5 years.
9. To make loans on security of shipbuilding materials or equipment.
10. To subscribe for or take up shares which have been approved by the competent Minister of State.
11. To subscribe for national or local bonds and companies' debentures, or to act as agent for receiving these installments, payable by general subscribers or paying principal, and interest and dividends.
12. To make call loans, or loans for a fixed term, on security of sites and buildings belonging to factories or of residential land (or) buildings lying in localities where the city organization law is in force or in city land to be designated by imperial ordinance: *Provided, however, That the total amount of such loans shall not exceed one-half of the amount of the paid-up capital.*
13. To purchase national or local bonds or companies' debentures and shares or gold and silver bullion with available money which the bank may employ for the purpose.

The bank is authorized to issue debentures to an amount not exceeding ten times its paid-up capital, provided, however, that the amount of such debentures shall not exceed the total amount of outstanding loans, discounted bills, and national or local bonds, companies' debentures, and shares of gold and silver bullion in hand. The bank, with the approval of the Minister of Finance, may issue debentures, irrespective of the restriction, only if funds are required for enterprises for public benefit undertaken in a foreign country.

Loans to Industry and Municipalities

The bank has furnished funds necessary for the extension or readjustment of industrial business regardless of whether the firms were large or small, so long as they were favorable credit risks, as remarked by the president at the stockholders' meeting, February 6, 1928. The bank underwrote debentures for Niigata Prefecture, the Seibu Railway Co., and the Azumi Electric Co. In co-operation with other banks the Industrial Bank underwrote and floated debentures for the City of Tokyo Water Works and Drainage Board, South Manchurian Railway Co., Daido Electric Power Co., Hakusan Hydro-electric Power Co., and Kokusai Steamship Co.

In addition, in recent years the bank has extended assistance to the Oriental Development Co., the South Manchuria Railway, the Tokyo Municipal Electric Works, the Fuji Paper Manufacturing Co., the Japan Fertilizer Co., the Tokyo Stock Exchange Co., the Ujigawa Electric Co., the Ina Electric Co., the Teikoku Sugar Manufacturing Co., the Formosa Electric Power Co., the Iwaki Cement Co., the Hakusen Water Power Co., the Ibigawa Electric Co., the Morioka Electric Light Co., the Shinano Electric Co., the Komatsu Electric Co., the City of Utsunomiya, the City of Tokyo Motor Bus Enterprise, the Tobu Electric Power Co., the Nippon Yusen Kaisha, the Tokyo Rope Manufacturing Co., and other public utilities and industrial enterprises.

Recently it was reported that the ministry of communication, was considering a measure authorizing it to loan Y.12,000,000 at low rates of interest to trampship owners, for the construction of new ships. These advances would be made through the Industrial Bank of Japan.

Loans to municipalities comprise another form of activity of the Industrial Bank, as exemplified by the Y.20,000,000 short-term loan to the city of Tokyo in December, 1929. This loan, of two months' maturity, was granted at 1.6 sen per Y.100 per diem.

Security More Thoroughly Considered—Advances to Small Borrowers

Late in 1927 the Industrial Bank announced a change in its loan policy. Prior thereto an application for a loan was judged more by the future possibilities of the industry in question and the business reports of the individual company than by the character of the security offered. The bank's new policy is reported to give more attention to security values.

For small loans the Industrial Bank maintains a separate account entitled "Special fund for petty merchants and manufacturers." The *Japan Advertiser* of December 29, 1929, reported that Industrial Bank advances to medium-sized and small industries totaled Y.35,792,000 in 2,882 accounts. The maximum advance was given as Y.100,000. These advances were secured by factories, machinery, and real estate. The principal sums were as follows:

Industry and number of accounts		Total advances (million yen)
Machinery manufacturing, 217	.. ..	6.0
Chemicals, 299	.. ..	4.9
Sawmilling, 217	.. ..	4.7
Printing and bookbinding, 289	.. ..	4.3
Spinning and weaving, 401	.. ..	4.0
Foodstuffs, 319	.. ..	3.7

Since the earthquake of 1923 the Government has followed a policy of extending aid to small borrowers through the Industrial Bank. After the crisis of 1927, when small borrowers experienced difficulty in obtaining accommodation, the Deposits Bureau decided to loan Y.50,000,000 to such borrowers through the Industrial Bank, the Hypothec Bank system, and the Co-operative Societies' Central Bank. Through the last-named organization assistance was extended to the local credit associations. Loans were limited to Y.3,000 bearing interest from 5 to 6½ per cent.

Loans to China

The Industrial Bank of Japan, with other Japanese banks and companies, has participated in numerous loans to the Chinese Government and to Chinese companies. Much of the money thus advanced is "frozen." According to a report of the Deposits Bureau of the ministry of finance, as made public in March, 1929, that bureau then had outstanding advances of Y.19,151,000 made to several Chinese enterprises through the Industrial Bank of Japan.

With the Bank of Taiwan and the Bank of Chosen, the Industrial Bank of Japan took part in the Y.10,000,000 7½ per cent. Kirin-Hueining Railway loan of June 18, 1918; the Kaomi-Hsueh-show Shunte-fu Tsinan-fu Railway loans of September 28, 1918; the Manchurian and Mongolian four-railways loan of the same date; the mine and forestry Y.30,000,000 loan of July 3, 1918; the war-participation Y.20,000,000 loan of September 28, 1918; and the Bank of Communications' Y.20,000,000 loan of 1918 (January 20, 1918). These, with others, are known as the Nishihara loans.

In February, 1922, the Industrial Bank participated in floating the Chinese Government 8 per cent. bonds for refunding internal and foreign short-term debts. (The Japanese share of this issue, commonly known as the "\$96,000,000 loan," amounted to 39,608,700 gold yen.)

Aside from the Nishihara loans the bank's principal investments in China have been made through three Japanese development companies. The Industrial Bank of Japan participated in the organization of the Toa Kogyo Kabushiki Kaisha (East Asia Industrial Co.) in 1909, being the largest stockholder. This company, with its head office in Tokyo, and branches in Shanghai, Peking and Hankow, was formed to finance Sino-Japanese industrial enterprises in China. The two remaining development companies

(Continued on page 585).



Motor Shipbuilding in China

Opening of a New Shipyard on Kowloon

AT the recent opening of the new dockyard of the South China Motor Shipbuilding & Repairing Works, Ltd., at Kowloon, Captain Brandt, of Brandt & Co., Hongkong, General Managers for this new concern, made a most interesting dedicatory speech, which explains in a few words just why Chinese shipping enterprises are operated at a heavy loss and why an immense amount of new construction is absolutely essential for the further advance of the nation. He pointed out that during the last twelve months the net increase of steam tonnage in the world was only 148,000, whereas the increase of motor-ship tonnage was 1,468,000 tons. It is especially in motor-ships that a great future looms ahead for China, being more advantageous for short voyages and for longer delays in harbor and as all expenses such as upkeep of steam, boilers and a large engine-room staff are eliminated, they are obviously far more economical.

Inviting attention to the incredible growth of the world's gross registered tonnage of 19,511,000 tons in 1898, 45,511,000 in 1914, to 68,404,000 tons in 1930, he said that out of this total, China owns only 240,000 tons, about a quarter of one per cent.

"China ranks with Greece in possessing the most obsolete tonnage in the world. Greece has, however, made it a law that no one can buy steamers more than 25 years of age, and with a view to the re-organization of the national mercantile marine, and also to assist the shipowners to modernize their fleets, the National Bank and the Mortgage Bank have given pecuniary assistance to shipowners beginning with a loan amounting to £20,000,000."

After stressing the general detrimental effect of shipping subsidies, Captain Brandt said that in "China, however, the modernization of the mercantile marine must be carried out by private enterprises, because the Chinese Government will not be able for some time to assist shipowners with subsidies. The average age of the present Chinese mercantile marine is 34½ years, and at least 50 per cent. of the tonnage is ripe for scrapping. Taking this fact into consideration, it will be seen that this the largest country in the world with a population of over 450,000,000, doing an enormous import and export business, and with its numerous harbors, and rivers and considerable coast port trade, has only ⅓ of 1 per cent. of the world's tonnage. These figures speak for themselves and no further comments are needed; it will, therefore, be clearly seen that it is impossible for Chinese shipowners to compete with the others, especially in view of the enormous running expenses in the upkeep and repair of steamers which leave them no profit whatsoever."

And yet, with a tonnage of 240,000, of which at least half should be in the junk pile, Chinese shipowners, are agitating

for increased protection against foreign participation in the coastwise and river shipping trade, and the Nanking Government is seriously discussing the abrogation of foreign coastwise and internal navigation rights. This high light on China's mercantile position is only a reflection of what is hampering other industries. Captain Brandt makes it very clear that the construction of a national mercantile marine is just as essential as the building of railways and highways to handle the traffic of the country. If China is to drive out foreign tonnage from participation in her internal carrying trade, she must build at least a million tons of new vessels within the next few years.

With this picture of the future possibilities of China's new tonnage requirements before it, the South China Motor Shipbuilding & Repairing Works, Ltd., was organized and land purchased for the erection of up-to-date shipbuilding yards and repair shops. The new shipyard of the Company at Kowloon has a total area of 222,000 square feet, of which 140,000 square feet are reclaimed and 82,000 square feet are marine rights with a depth of 24 feet at low tide. This area can be extended by arrangements with the owners of the adjoining property which has an area of 145,000 square feet permitting an extension to a total area of 367,000 square feet in case of future necessity. The authorized capital of the Company is to be \$2,000,000 of which \$1,500,000, is to be paid-up for which prospectus will be issued in due course.

There are at present three building berths for ships up to 300 feet in length and two smaller ones for small crafts; and, in addition the company has decided to build four patent slipways for ships up to 325 feet in length and two fitting-out wharves of 200 feet in length each with a heavy lift crane and a small railway to run over the whole yard. It is, furthermore, contemplated to order from Europe additional machineries and plants. Everything in the shipyard will be driven by electricity, thus eliminating entirely the use of steam and gasoline engines, and every machine will be driven separately.

New Turbo-Electric Liner for New Zealand

Announcement has just been made that Lord Inchcape, on behalf of the Union Steamship Company, Limited, of New Zealand, has placed an order with Messrs. Vickers-Armstrongs, Limited, for an important passenger vessel. The ship is to be built at Barrow-in-Furness and the main propelling turbo-electric units will be supplied by the British Thomas-Houston Company, Limited, in collaboration with Messrs. Vickers-Armstrongs, Limited.

Use of Oxy-Acetylene Blowpipe in Shipyards

THE Oxy-Acetylene torch plays a very important part in shipyards especially in repair work. Almost without exception repair jobs on ships are "rush jobs." Time is the very essence of the contract. When a vessel has to go into dry dock the time lost by the ship being laid up represents, according to tonnage of vessel, a very considerable amount in money, quite apart from the amount being paid daily for the dry dock and often costly demurrage on the ship itself. Therefore, the importance of getting the vessel quickly back into service again is quite apparent.

Shipyard engineers therefore, were not slow in realizing the time and labor that could be saved by use of the Oxy-Acetylene process. The Oxy-Acetylene cutting torch has proved invaluable in speeding up work of many kinds, but particularly in removing damaged ships plates. Ships plates are of course lapped and riveted, usually a double row of rivets of from $\frac{3}{4}$ -in. to $\frac{1}{2}$ -in. On the outside plate the rivet hole is countersunk. The rivet is put through from the inside

out but to-day it is general practice to "burn" the rivets. This is done as follows:—

If there is much paint or corrosion, they are first gone over with an air hammer to remove paint, etc. The operator with cutting torch follows and has to cut the riveted head in such a way that he does not damage the countersink in the plate, especially when these plates are to be used again. The cutting is done in this manner. He starts his cut towards one side, swings across the head, circles round the outer edge, then zig-zag across to other side, with possibly a final swing back to centre.

The rivet is only cut just beyond the bottom of the countersink and, as mentioned above, without damaging the plate itself. The oxy-acetylene operator (usually called a burner) is followed by a man with air gun fitted with long punch, who punches out the burned rivets. By this method good operators can remove rivets at the speed of about 3 to 1 as compared with drilling and what is also important, with much less damage to the plates.



Cutting on the S.S. Canadian Carrier

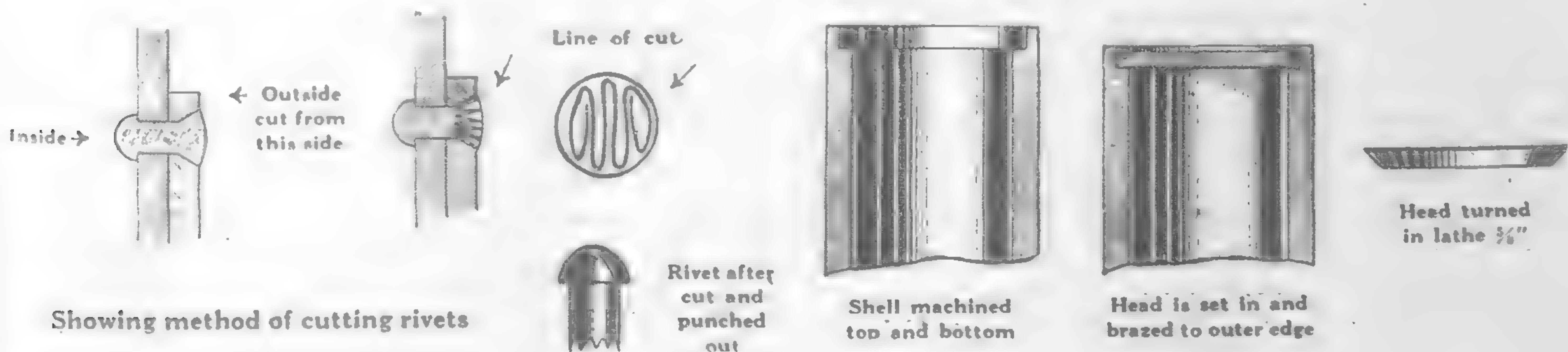
Manifold on Air Line in Shipbuilding Yard: 3-in. Pipe with 1-in. Connections Brazed

Operator Cutting Air Holes in Double Bottom Tank Reverse Frames on Hull No. 5 of Ice Breaker for Hudson Strait

and riveted from the outside, therefore into the countersink, which causes the plates to be drawn up very tight. When plates have been damaged by collision, ice or some other cause, they have to be removed and replaced. Sometimes it is possible to recondition the plates and use them again. To remove the plates the rivets have to be taken out. Formerly these were drilled and punched

An expert operator will cut 100 rivets per hour and some operators can exceed that figure. On a job where a number of plates have to be taken out, many thousands of rivets have to be "burned," and it is not uncommon to see anywhere from 10 to 20 oxyacetylene operators burning rivets just as fast they can go, on one job.

(Continued on page 585)



Showing method of cutting rivets

Rivet after cut and punched out

Shell machined top and bottom

Head is set in and brazed to outer edge

Head turned in lathe $\frac{3}{8}$ "



General View of the Kobe Shipyard and Engine Works

Shipbuilding Industry in Japan

By EISABURO KUSANO

JAPAN launched nearly 165,000 tons gross of ships during 1929. The figure represents a new high record since the European War boom of 1916-21. In February, 1930, moreover, there were almost 210,000 tons of ships that were under construction at the Japanese shipyards. This liveliness is remarkable in view of the universal inactivity of the shipping circles all over the world. But the peculiarity of the situation is then further enhanced by the fact that the enormous building program of the N.Y.K. and the O.S.K., (which are largely responsible for the recent revival of the shipbuilding industry in Japan,) have been almost completed and that the shipbuilders now already suffer from the acute want of work again.

During the first six months of 1930, 39 ships aggregating 110,000 tons were launched. The ships under construction on July 1, on the other hand, numbered 33, totaling 139,662 tons, including 22 ships, 127,310 tons of diesel vessels, and two ships, 235 tons of sailing ships, the remainder being steamers.

Of these ships under construction on July 1, those of which the tonnage is larger than 1,000 tons were as follows:

YOKOHAMA SENKYO, YOKOHAMA

- M. S. *Hiye Maru*, 11,000 tons gross, Burmeister, launched in February, 1930, N.Y.K.
- M. S. *Kanto Maru*, 8,630 tons gross, M.A.N., launched in April, 1930, Kishimoto Steamship Co., Ltd.
- M. S. *Kansai Maru*, 8,630 tons gross, M. A.N., expected to be launched in August, 1930, Kishimoto Steamship Co., Ltd.
- M. S. *Teiyo Maru*, 9,000 tons, expected to be launched in November, 1930, Nihon Tanker Co., Ltd.

ASANO ZOSENJO, YOKOHAMA

- M. S. *Unnamed*, 5,800 tons, Sulzer, finished 40 per cent., T. K. K.

URAGA ZOSENJO, URAGA

- M. S. *Hokusei Maru*, 7,500 tons, M.A.N., launched in June, 1930, Yamashita Steamship Co., Ltd.

OSAKA TEKKOJO, OSAKA

- M. S. *Heian Maru*, 11,000 tons, Sulzer, launched in April, 1930, N.Y.K.

KAWASAKI ZOSENJO, KOBE

- S. S. *Daini Seikan Maru*, 2,500 tons, launched in June, 1930, Imperial Government Railway.
- M. S. *Ryoyo Maru*, 3,800 tons, M.A.N., expected to be launched in September, 1930, T.K.K.

TAMA ZOSENJO (MITSUI), TAMA, (OKAYAMA PREF.)

- S. S. *Sorachi Maru*, 3,800 tons, launched in May, 1930, Kyoritsu Steamship Co., Ltd.
- M. S. *Unnamed*, 7,400 tons, Burmeister, launching unfixed, double bottom being built, Shimaya Steamship Co., Ltd.

MITSUBISHI ZOSENJO, KOBE

- S. S. *Shoshun Maru*, 3,975 tons, launched in April, 1930, Dairen Steamship Co., Ltd.

MITSUBISHI ZOSENJO, NAGASAKI

- M. S. *Tokai Maru*, 8,300 tons, Sulzer, launched in May, 1930, O.S.K.
- M. S. *Sanyo Maru*, 8,300 tons, Sulzer, launched in July, 1930, O.S.K.
- M. S. *Hokuroku Maru*, 8,300 tons, Sulzer, expected to be launched in September, 1930, O.S.K.
- M. S. *Yasukuni Maru*, 11,800 tons, Sulzer, launched in February, 1930, N.Y.K.



Twin Screw Geared Turbine Passenger and Cargo Steamship "Hoten Maru" of the D.K.K. Moored Alongside Floating Dock of the Mitsubishi Kobe Shipyard and Engine Works



of the Mitsubishi Shipbuilding and Engineering Co., Ltd.

M. S. *Unnamed*, 6,600 tons, expected to be launched in January, 1931, Mr. Genkichi Yamamoto.

M. S. *Unnamed*, 7,200 tons, expected to be launched in December, 1930, Kokura Oil Co., Ltd.

Note:—Of the foregoing list, the O.S.K. liner *Hiye Maru*, which was being built at the Yokohama Dockyard Company, and the Kyoritsu Kisen liner *Sorachi Maru*, which was being built at the Tama Works of the Mitsuis, were completed and delivered during July.

The steam or motorships larger than 1,000 tons which were completed and delivered during the first half of 1930 are as follows:

YOKOHAMA SENKYO, YOKOHAMA

M. S. *Chichibu Maru*, 17,497 tons gross, Burmeister, completed in March, 1930, N.Y.K.

M. S. *Melbourne Maru*, 5,437 tons gross, Burmeister, completed in March, 1930, O. S. K.

M. S. *Hikawa Maru*, 11,621 tons gross, completed in April, 1930, N. Y. K.

M. S. *Brisbane Maru*, 5,425 tons gross, completed in May, 1930, O. S. K.

URAGA ZOKENJO, URAGA

S. S. *Munakata Maru*, 3,301 tons gross, completed in March, 1930, The Yawata Iron Works.

OSAKA TEK-KOJO, OSAKA

M. S. *Heiyo Maru*, 9,815 tons gross, Sulzer, completed in March, 1930, N. Y. K.

HARIMA ZO-SENJO, KOBE

S. S. *Ninode Maru*, 5,181 tons, completed in March, 1930, Tochigi Shoji K.K.

TAMA ZOKENJO, (MITSUIS), TAMA, OKAYAMA PREF

S. S. *Konei Maru*, 12,353 tons, completed in June, 1930, Mr. Reizo Yamashina.

MITSUBISHI ZOKENJO, NAGASAKI

M. S. *Tatsuta Maru*, 16,800 tons, Sulzer, completed in March, 1930, N.Y.K.

M. S. *Rio de Janeiro Maru*, 9,500 tons, Sulzer, completed in May, 1930, O.S.K.

M. S. *Teru Kuni Maru*, 11,800 tons, Sulzer, completed in May, 1930, N.Y.K.

M. S. *Kinai Maru*, 8,300 tons, Sulzer, completed in June, 1930, O. S. K.



Engines of the "Hino Maru"

Building Capacity Exceeds Demand

Japan's shipbuilding capacity to-day by far exceeds the present requirements. So much so that even with the recent revival of the industry with 200,000 tons of ships under construction, only about 80 per cent. of their total equipment was engaged. Moreover, all the signs now indicate to the difficulty of the Japanese shipbuilding companies maintaining the recent standard of activity. The excess of extension of their

capacity during the European War boom is consequently blamed for the present acute depression.

There are 18 shipbuilding companies which own 21 factories and 75 slips in Japan at present. Of these, 11 influential companies possess 18 factories with 73 docks and 63 slips of



Motor Cargo Boat "Hino Maru," Built by the Kobe Works of the Mitsubishi Shipbuilding & Engineering Co., Ltd.; Specially Designed for Transporting Salt and Lumber



General View of the Sakurajima Shipyard of the Osaka Iron Works, at Osaka

which respective capacity is larger than 1,000 tons. They are :
(In alphabetical order)

Names of Companies			No. of docks	No. of slips
Asano Zosenjo K.K.	...	...	2	6
Fuji-Nagata Zosenjo K.K.	...	...	1	4
Hakodate Senkyo K.K.	...	...	1	1
Ishikawajima Zosenjo K.K.	...	...	2	4
Kawasaki Zosenjo K.K.	...	...	1	7
Kobe Seikojo K.K. (Harima Works)	...	...	1	5
Mitsubishi Zosenjo K.K. :				
Kobe Works	...	...	3	3
Hikoshima Works	...	...	3	-
Nagasaki Works	...	...	3	7
Mitsui Bussan K.K. (Tama Works)	...	...	2	3
*Osaka Tekkojo K.K. :				
Sakurajima Works	...	...	1	5
Innoshima Works	...	...	5	6
Chikko Works	...	...	1	1
Kasadoshima Works	...	...	2	-
Mukojima Works	...	...	2	-
Hikoshima Works	...	...	2	-
Uraga Senkyo K.K.	...	...	2	6
Yokohama Senkyo K.K.	...	...	3	5
Total	...	...	37	63

Note :—These docks and slips have a capacity which is larger than 1,000 tons each ; K.K. stands for Kabushiki Kaisha, meaning Company, Limited.

How the present building equipment of the Japanese shipbuilding companies exceeds the requirements to-day clearly be shown by comparison of the present state of affairs with that of before the European War.

The annual launching of ships (which roughly corresponds to the demand for new ships) in Japan fluctuated within a narrow range around 50,000 ton mark before the European War. After the outbreak of the war, however, this tonnage increased by leaps and bounds until it reached a heavy total of 610,000 tons in the eventful year of 1919. (The year of 1919, by the way, was replete with unprecedented events in the annals of the world shipbuilding. Apart from the fact that the launching of the ships all over the world in that year amounted to a staggering total of 7,200,000 tons, the United States captured the first place for the first time in the international ranking with her 1,051 ships, aggregating 4,075,385 tons. Four million tons are a heavy total which is larger than any one year's total tonnage of ships launched all over the world prior to the European War, and also, it is the highest record so far in the world-history of the ship construction for one country launching such a huge tonnage of ships in single year. Great Britain, which had by far exceeded all the other countries in the volume of ships annually launched, for once conceded the first place to the United States, while France who was and is one of the most prominent shipbuilding countries of the world occupied such an insignificant place as the twelfth in 1919.)

In this unprecedentedly prosperous year of 1919, when Japan ranked third in international shipbuilding for the first (and the

last time so far) the dockyards of the Empire had 13 times as much work to do as compared with the low level of the pre-war days. Their building capacity was then extended by from eight to ten times as much stimulated by the boom.

There were five shipbuilding companies operating six factories which were equipped with 17 slips before the War. During the war, however, the number of companies increased to 56 with 57 factories and 157 slips.

It appears to be more or less reckless that the shipbuilding facilities be extended so abruptly especially in view of the fact that the phenomenal increase in the demand for ships in Japan in those days apparently was of a temporary nature. Nevertheless, the Japanese shipbuilders had the Imperial Navy's famous eight-eight fleet program in view. They were convinced that they would have plenty of work to do even after the European War boom was over.

Contrary to their expectations, however, the big Navy plan did not materialize in consequence of the Washington Conference. Furthermore, Japan's annual ship construction declined to the former 50,000 tons level as soon as the war boom was gone, as seen in the following table which compares the number and tonnage to the ships annually launched in Japan with that of all over the world since 1901 :

Years	JAPAN		WORLD	
	No. of ships	Tonnage	No. of ships	Tonnage
1901	94	37,208	1,538	2,617,539
1902	53	27,181	1,650	2,502,755
1903	6	34,514	1,650	2,145,631
1904	67	32,969	1,643	1,987,935
1905	81	31,725	1,576	2,514,922
1906	107	42,489	1,836	2,919,763
1907	78	66,254	1,788	2,778,088
1908	73	59,725	1,405	1,833,286
1909	75	52,319	1,063	1,602,057
1910	70	30,215	1,277	1,957,853
1911	109	44,359	1,599	2,850,140
1912	168	57,755	1,719	2,901,769
1913	152	64,664	1,750	3,332,882
1914	32	85,861	1,319	2,852,753
1915	26	49,408	743	1,201,638
1916	55	145,624	964	1,688,080
1917	104	350,141	1,112	2,937,786
1918	198	489,924	1,866	5,447,444
1919	133	611,883	2,483	7,144,579
1920	140	456,642	1,759	5,861,686
1921	43	227,425	1,379	4,356,843
1922	49	83,419	852	2,467,084
1923	44	72,475	701	1,643,181
1924	31	72,757	924	2,247,751
1925	23	55,784	855	2,193,404
1926	26	52,405	600	1,674,977
1927	19	42,359	802	2,285,679
1928	37	103,663	869	2,699,239
1929	40	164,457	1,012	2,793,210



Hikoshima Works of the Osaka Iron Works

The sharp decline in the volume of ships launched in and after 1922 is due partly to the active import into Japan of second-hand ships from Europe.

Prominent shipping companies in Europe had realized in those days the urgent need of building new, economical ships to prepare themselves for accelerating competition in the trans-Atlantic trade, and they disposed of their holdings of old ships at sacrifice of the price in order to raise part of the building funds. The Japanese shipping concerns, on the other hand, were in need of readjusting the high cost of ships registered in their books, and therefore, they proceeded purchasing these second-hand ships cheap. They were encouraged by their creditors, too, as the latter were ignorant of the fact that they were thus tightening the noose around Japan's shipping enterprise, and incidentally, their own as well.

It became a vogue to import these cheap second-hand ships from Europe. Even influential companies, as well as amateurs, began buying them with a result that practically all the old ships in Europe were brought to Japan, their volume amounting to about 1,500,000 tons, which is heavier than the total tonnage of ships that Japan had before the war. It has necessarily degraded the quality of Japan's commercial fleet to such an extent that the Japanese ships have gradually been forced out of the international market as business grew slow and competition keener.

It was since 1927 that Japan began to restrict the import of old ships. In 1927, about 100,000 tons of them were brought to this country, but a large part of them was for scrapping and therefore the tonnage of these imported ships which were actually operated sharply declined. This tendency was further accentuated; so much so that in 1929, only 33,000 tons of them were imported, and almost all of them were scrapped. Nevertheless, Japan has more ships than she can possibly engage to-day and therefore one seldom hears of any negotiations going on in the way of importing old ships.

In spite of the decline in the demand for new ships in Japan in and after 1922, the capacity of the Japanese shipyards has not been diminished accordingly. Some of the temporary shipbuilding yards have been demolished since business became slack, and then, the great earthquake of September, 1923, delivered a considerable blow to shipyards in the quake afflicted area. Even then, the shipbuilding capacity to-day is four to five times as large as that of pre-war days.

By way of compensating the loss of shipbuilders resulting from the scrapping of the eight-eight fleet plan, the Imperial Navy made a considerable disbursement to shipbuilding companies. It appears, however, that the shipbuilding companies

spent very little portion of this compensation money in the way of rationalizing their enterprise, that is, to diminish their equipment to cope with the new situation. When the relationship of the demand and supply of the shipyards is calculated as 1 to 1 in pre-war days, this ratio has become 1 to 4 or 5 to-day.

Recent Temporary Prosperity

The shipbuilding industry in this country has been active during the past few years. It has resulted from factors of temporary nature, however, and the liveliness is already gone. Included among these factors are three major ones, which are: (1) the easiness of the money market, (2) the construction of new ships to be placed on subsidized lines, and (3) the craze for diesel engined ships.

1.—The easiness of the money market: as was widely known there occurred an unprecedentedly severe financial panic in Japan in 1927. Leading banks closed their doors while minor local banks suffered from runs. To save the situation, the Government made generous financial accommodations to banks. The crisis was thus patched up, but the financiers became timid after such a panic, and they endeavored to hold as much cash on hand as possible. A short time afterwards, therefore, idle money held by prominent banks amounted to an enormous sum, resulting in the inevitable decline of the interest rate toward the end of 1927 and in the early part of 1928. Any enterpriser could sell debentures bearing such a low yield as 5 to 6 per cent. The shipping companies, therefore, renewed their old loans on better conditions, and issued new debentures as well, thereby obtaining a considerably heavy amount of funds for building ships. This is one of the important causes that brought about the activity of the shipbuilding industry in and after 1928.

2.—The construction of new ships to be placed on subsidized lines: it was a happy coincidence that the time had come when the shipping concerns operating on subsidized lines must renew their fleet of ships placed on such lines. In fact, some of these companies had put off the placing of new ships on such subsidized lines. But they could no longer postpone the replacement of aged ships with



General View of the Innoshima Works in Hiroshima Prefecture Owned by the Osaka Iron Works

new, economical ones especially as foreign companies began operating excellent ships on some of these lines. And, at this very moment, the money market became easy, and the cost of construction, too, became low as the shipyards had also been suffering from the long continued depression,

It was a good chance for shipping companies to build new ships, and furthermore, the Department of Communications, too, encouraged the shipping companies to avail themselves of this opportunity. Subsequently, these companies began building ships.

3.—The craze for diesel engined ships: now is a momentous period when the propelling machinery of ocean going liners are on the verge of being revolutionized; the reciprocating steamships are fast going out of fashion just as the sailing ships were replaced by steamers many years ago. The modern ocean liners are equipped with either diesel engines or turbine engines.

A glance at a report of the ships launched all over the world in recent years show that the number of steamers are steadily declining while that of diesel engined ships registered a marked increase. In 1929, the world's launching of ships excluding sailing ships totaled 981 ships, aggregating 2,774,191 tons. This total included 347 motorships aggregating 1,269,888 tons. Admitting that the tonnage of steamers launched in the world showed some increases in recent years, it has to be borne in mind that the aggregate total tonnage of ships launched also registered a remarkable increase in the past few years.

In Japan, however, the transference from steamers to motorships started rather late. When the shipping department of the Mitsui Bussan Kaisha built the motorship *Akagisan Maru*, 6,981 tons, in 1924, followed by the T. K. K.'s *Fukko Maru*, 6,042 tons, they were the first of the kind in this country. Their successful operation of these diesel engined ships then served as eye-opener to Japan's shipping concerns generally.

Meanwhile the import duty on second hand ships was raised in April, 1926, with the primary object in view of discouraging the further importation of old ships into this country, and this measure necessarily rendered the trade less profitable. This fact, coupled with the general awakening of the people concerned to the situation that Japan's shipping enterprise was doomed unless the quality of the fleet in its entirety is drastically improved, stimulated the shipping concerns to contemplate the construction of diesel engined ships, it resulting in their abrupt enthusiasm about them.

The construction of new, fast ships, including steamers, then started in a rapid succession at dockyards where grasses had grown



Staal Turbine Built by the Osaka Iron Works

after many years of absence of work. But most of these new ships were equipped with diesel engines. If a reciprocating steam engined ship was built, it was specially designed for loading of long lumber or heavier volume of general cargo.

The diesel ships also had a better design. Most of the diesel cargo boats were to be operated on the Pacific lines where lumber is the bulk of the goods. Consequently, all of these ships were specially designed to fit themselves for carrying lumber and also to utilize the deck space as well.

When the tramp ship concerns thus became enthusiastic about the motorships, such influential companies as the N.Y.K. and the O.S.K. found it necessary to build new ships to place on the subsidized lines, such as the European Line, San Francisco Line, Australian Line, Seattle Line, and the New York Line, each of these lines requiring from two to four new ships. Moreover, these companies also decided to adopt diesel engines. Hence the phenomenal activity of the diesel ship construction in Japan.

Prospects of Shipbuilding in Japan

Further study of these factors as to their durability and also some other proposals that are now pending—for instance, the proposed merger of all the tramp ship owners and also the amalgamation of dockyards—will show what possibilities are in store for Japan's shipbuilding industry in the future.

To begin with, the first and the second of the foregoing three major factors, i.e., the easiness of the money market and the active construction of ships for subsidized lines, are out.

Japan removed the embargo on the gold exportation in January, 1930, with the subsequent outflow of gold from the Island Empire. The relationship between this measure and the interest of the shipyards is complicated, but taking all in all, it is unfavorable in that the money market tightens and the funds available for shipping firms to build new ships become smaller.

Primarily, shipbuilders spend from 70 to 75 per cent. of their contract money for construction of a new ship in the purchase of materials required for the undertaking, and spend the remainder of from 25 to 30 per cent. in the payment of wages and upkeep of their equipment. And, most part of the materials are purchased after the order is given.



Harima Shipbuilding Yard of the Kobe Steel Works, Ltd.

Japan's return to the effective gold standard is advantageous for the shipyards so far as the purchase of materials is concerned as the measure improves the yen exchange rate and subsequently reduces the market quotations of commodities. But then, the shipyards must reduce the bids accordingly, while the wages they pay do not decline in due proportion to the fall in the price of commodities. Furthermore, the improvement of the yen exchange rate is disadvantageous in the inverse ratio to shipping companies operating in the international markets and get the freightage settled in foreign currency; furthermore, the tightening of the domestic money market resulting from the outflow of gold necessarily restricts the active movement of cargo in the home shipping market, it further reducing the income of the shipping companies. It is only natural that when the income of the shipping companies decline, it is less likely that they build new ships.

It is true that the shipping companies build on the basis of a calculation of the earning possibilities for a period spreading from 20 to 30 years, that the recent market inactivity is relatively of temporary nature, and that it is absurd to imagine that all the shipping companies should become suddenly so pessimistic because of the temporary depression as to drop the building program altogether. They know also that it is profitable in the long run to construct ships while they can get them cheap. But the question is that how many companies are there which can afford to launch new ships when the shipping market is decidedly inactive and the money market is fast tightening since the removal of the gold ban. There are very few of them.

As regards the construction of ships to be operated on the subsidized line, the program has been almost completed without any indication of its being further extended.

At the beginning of 1930, there were about 200,000 tons of ships that were under construction at the Japanese shipyards. Included among these were from 120,000 to 130,000 tons of ships that were to be operated on the subsidized lines or that which can be classed with these special ships. When the tonnage of these special ships is deducted from the total, the balance is from 70,000 to 80,000 tons which roughly correspond the tonnage that Japan loses annually either by disasters at sea or by scrapping. This tonnage is slightly more than that which was built during the worst period after the War, that is, in 1925 and 1926, when the annual launching of new ships was less than 50,000 tons. With this in view, if the worst is to come, the construction of new ships in Japan in and after 1931 will decline to about 70,000 or 80,000 tons—with all the recent prosperity gone.

The only bright spot in the prospects to-day is the recent activities of the shipping companies shown in the replacement of their reciprocating steamers with diesel vessels. Nevertheless, it is not merely for the pleasure of possessing diesel vessels that they build them: it is because they cannot carry on business with any margin of profit without them. If the money market becomes tight and if the prevailing low level of freightage (which is below even the diesel rate) continues, it is likely that the shipping companies may change their mind; they might be contented with the partial improvements, such as installment of oertz rudder or exhaust turbines on their old steamers instead of building new diesel boats. In fact, there are a number of firms which are hesitant at present to carry out their plan of building diesel ships in the face of the recent acute depression. Among others, there is a certain firm which has given a contract to the Nagasaki yard of the Mitsubishi to build a 9,800 tons diesel ship but has just recently cancelled the order.

Kohusai Kisen's two 10,000 ton class diesel liners, Dairen Kisen's four 4,500 ton class cargo boats, Iino Shoji's one 12,000 ton class oil tanker, and the Government Railway's two 4,000 ton class diesel ferry boats to be operated between Shimonoseki and Fusan (Chosen)—these are about all the plans worth-mentioning that are drafted since the beginning of 1930.

The conclusion of the London Naval Treaty is another factor which is decidedly unfavorable so far as the shipyards are concerned, as the Imperial Navy's building program will be reduced to about one half. According to the present building program of the Navy, it spends Yen 88,000,000 annually. It is unknown so far how the program will be carried out the fiscal year of 1931-2, but the Navy used to give 39 per cent. of its entire building work to civilian shipbuilding companies, the Naval arsenals doing the remainder of the 61 per cent. Nevertheless, up to 60 per cent. of the foregoing work reserved for the Naval arsenals are further

sub-contracted to civilian shipbuilding companies. Consequently, taking all in all, the actual amount of work done by the Naval arsenals amount to about 30 per cent. of the entire program, the remainder 70 per cent. being given to private concerns.

According to investigations made by Mr. Banji Iijima, executive director of the Osaka Iron Works, the total amount of work done during the three years ending 1929 by 10 shipbuilding companies which are appointed by the Navy to do the Navy's work amounted to approximately Yen 310,000,000 and that up to Yen 110,000,000 of this total or one-third of the total was that given by the Navy. The 10 companies are: the Kawasaki Zosenjo, the Mitsubishi Zosenjo, the Uruga Senkyo, the Yokohama Senko, the Osaka Tekko-jo, the Fuji-Nagata Zosenjo, the Ishikawajima Zosenjo, the Mitusi Zosenjo, the Yokohama Yacht Kosakujo, and the Osaka Seitetsujo.

In consideration of the fact that the Navy's work given to these shipbuilding companies which corresponds to one-third of their total engagement, and that the condition of the commercial shipping circle is so unfavorable that there is but lean chance of getting orders for building new ships, one can easily imagine what sort of possibilities are in store for the shipbuilding companies of Japan.

Only Bright Spot

The only bright spot in all the branches of the shipbuilding enterprises in Japan is that the ship repair facilities is rather short of demand.

Japan had about 1,500,000 tons of ships in 1913-4. To-day the tonnage has increased to 4,300,000 tons including many crude ships that were built during the war boom, and also about 1,500,000 tons of ships that were imported after the War. Roughly speaking, therefore, the demand for repair work to-day has increased by about three times as much when compared with the pre-war days. On the other hand, the number of docks which can accommodate vessels larger than 1,000 tons was 30 before the War, while it has increased to 45 after the War. The increase is 50 per cent. or 1.5 times as much. Calculating the relationship between the demand and supply of the ship repairs facilities before the War at 1 to 1, the same relationship after the War is 3 to 1.5, respectively; in other words, the demand has increased twice as much. Furthermore, the recent degradation of the quality of the Japanese fleet of merchant ships in its entirety makes it all the more probable that the demand has increased. It is this sheer relationship of the demand and supply that the repair section of the shipbuilding industry alone knows no depression so far. It was with this in view that the Osaka Iron Works, among other companies, has converted all of their factories, excepting the Sakurajima Works in Osaka, into ship repair shops some time ago, concentrating the construction of new ships all at its Sakurajima Works.

This ship repair as well as engagement in other branches of building enterprises, such as manufacture of building materials for such civil engineering projects as construction of large buildings, bridges, and underground railways, the manufacture of various machinery, automobiles, rolling stocks, and airplanes, are likely to give shipyards in Japan a chance of tiding over the difficulty.

Nevertheless, if the 12 principal companies, four in Kanto (the Tokyo district), six in Kansai (the Osaka-Kobe district), and one each in Hokkaido and Kyushu, continue their keen rivalry from the sheer necessity of carrying on, they are bound to suffer from still severer financial difficulty and they may even have to close down in the long run, since they are taking orders at such ridiculous low prices which are far below the cost.

Merger and Joint Management

If the shipyards carry on their "skin game" without working out any arbitrary measures to cope with the situation, minor shipyards will gradually be forced out of trade and only companies which can stand such competition will remain with their aggregate total manufacturing capacity properly readjusted to the present day requirements by virtue of the process of the law of survival of the fittest. But it will take time before this stage of industrial readjustment is accomplished, and in the mean time, the situation will be further aggravated. Furthermore, it is impossible to let the shipyards suffer from such thorough-going impasse and depression in consideration of the social welfare, national defence, protection of peculiar technique, and the foreign competition. It has now

become a national issue how to rationalize the shipbuilding industry in Japan.

The Extraordinary Industrial Investigation Commission, at its 4th plenary session held at the Premier's official residence about the middle of July, 1930, passed a recommendation to the Government concerning the industrial rationalization of shipbuilding industry.

It consisted of three alternate plans which are:—

1. To effect an amalgamation of all the shipbuilding companies.
2. To promote a new company under joint investment of shipbuilding companies with the object in view of undertaking a joint management of the shipbuilding enterprise.
3. To promote a new company under joint investment of shipbuilding companies with the object in view of transferring the management of shipyards from the present owners to the new company.

Plan No. 1 provides that two or more than two shipyards might be induced to be amalgamated one with the other locally as the preliminary step toward the merger of all the shipyards in Japan into one gigantic organization, in view of the difficulty to realize the immediate amalgamation of all the companies at once. There is no substantial difference between plan No. 2 and 3 in principle except that the legal relationship between the shipyards and the new company is different; in both cases, the shipyards are to transfer all or part of their equipment to the new company and share whatever profits that the new company may make in proportion to their respective investments.

Simultaneous with the foregoing recommendation, it was also recommended that the Government may give more portion of the Naval building work to private shipbuilding companies, to revise the tariff regulations in such a manner as to bring forth the general betterment of the quality of the Japanese commercial fleet in its entirety, to grant subsidy to encourage the ship construction, to help shipyards engage part of their equipment in the civil engineering or other branches of heavy industrial enterprises, and to reduce or exempt the registration charges when merger of shipyards be effected.

The ideal of the industrial rationalization is the amalgamation of all the shipbuilders into one gigantic organization. Then the present reckless competition in bidding for contract will be gone, to begin with, at least so far as the shipbuilding is concerned, and general and substantial improvement of the business management will be effected by means of sub-division of work, concentration on one kind of work at one factory, distribution of work according to geographical considerations as well as that of equipment and technical ability of operatives in the employ of each shipyard, readjustment of the volume of work and the number of operatives, standardization of the manufactures, and also in the way of purchase of materials, and solicitation of orders.

But in this ideal plan of industrial rationalization, the unemployment of the surplus operatives is not taken into consideration. According to recent investigation of the Communications Office, there were about 43,000 operatives in the employ of principal shipbuilding yards, and it is estimated that Japan's shipyards will need only about 30,600 operatives in the future, the calculation signifying the fact that about 12,400 men will be turned out of work. But this calculation is made on the basis of the present situation in which all the shipyards carry on work independent of each other at various parts of the country. If the industrial rationalization be carried out to the extent of what is considered to be ideal, somewhere about 20,000 operatives will be found too many. This social problem is one of the first stumbling bloc in the way of the wholesale readjustment.

What proves to be a more serious obstacle in the way of the proposed amalgamation is the financial state of affairs of these companies. Since the post-war depression set in, the shipbuilding companies have resorted to all kinds of financial make-shifts in order to tide over the difficulties. In spite of the fact that their building capacity has been reduced, the paid-up capital as well as the debentures and loans of these companies have greatly increased compared with the pre-war days, as seen in the accompanying table: (Unit: Y.1,000)

	Before War (end of 1913)	During War (June, 1918)	After War (June, 1927)
Authorized capital ..	25,500	163,055	235,950
Capital paid up ..	23,150	109,554	159,835
Debentures and loans ..	3,600	22,050	99,283

Most part of the increased investments were employed in the financial make-shifts, but officially the property of these com-

panies has increased. In other words, the book value of the property of these companies is now considerably higher than their actual value.

If the shipbuilding companies were to be amalgamated, such fake value of their properties have to be re-valued based on their actual productive capacity. What is to be done with the wide difference of the book value and the actual value of the equipment of these companies is the problem that prevents the smooth realization of the amalgamation of these companies.

As a practical proposal, it is suggested that the merger or joint business management be brought forth among the four companies in Kanto (the Uruga Senkyo, the Yokohama Senkyo, the Ishikawajima Zosenjo, and the Asano Zosenjo) and the six companies in Kansai (the Osaka Tekko-jo, the Fuji-Nagata Zosenjo, the Kawasaki Zosenho, the Harima Senkyo, the Mitsubishi Kobe Works and the Mitsui Tama Works).

Present indications are that the four companies in Kanto have possibilities of being amalgamated into one concern. So far, negotiations are going on among the Ishikawajima Zosenjo, the Uruga Senkyo, and the Yokohama Senkyo. Mr. Masao Shibusawa, President of the Ishikawajima, Dr. Jun-ichiro Imaoka, President of the Uruga, and Mr. Kenkichi Kagami, President of N.Y.K. who represents the Yokohama Dockyard's interest in the present merger talk, have had frequent conversations recently with favorable results.

The financial state of affairs of these companies is relatively favorable compared with some of the other shipbuilding companies, as seen in the following table: (Unit: Y. 1,000)

	Uruga	Yokohama	Ishikawajima
Capital authorized ..	7,000	5,000	3,000
Capital paid up ..	5,250	5,000	3,000
Debentures ..	—	4,000	3,000
Bills payable ..	—	1,954	573
Loans ..	—	—	3,401

In the sub-division of work, the Uruga Senkyo is best fitted to undertake the construction of new ships, including the warships and special service ships of the Navy and special type of merchant ships. The Yokohama Senkyo can undertake the construction of general merchant ships as well as ship repairs, while the Ishikawajima Zosenjo can concentrate on the manufacture of all kinds of building materials, ship and land machinery, etc.

As for the six companies in Kansai, the prospects do not seem to be favorable for the industrial rationalization. To begin with, the Mitsubishi and the Mitsui will not dream of such a measure, while the Osaka Tekko-jo need not amalgamate with any other company as it has already readjusted its enterprise in the way of concentrating on ship repairs. The Kawasaki has such an enormous debt as Y.130,000,000 and is now undergoing business readjustment for the second time, while the Harima and the Fuji-Nagata have peculiar relationship with the Bank of Taiwan and the Jugo (the 15th) Bank, respectively, it preventing the smooth progress of any such merger talk. In the circumstances, it is not likely that the amalgamations of the Kansai companies be realized—unless something extraordinary, for instance, the business failure of some of these companies, happens. Furthermore, it is considered to be a matter of time that some of these concerns reveal such difficulty, it leading to the final industrial rationalization.

Included among other important plans that are now pending is the proposed financial accommodation by the Government to shipping companies. It is understood that the Government proposes to grant an annual loan to the amount of Y.10,000,000 for three consecutive years at a special low interest rate either the Industrial Bank of Japan or some other banks on condition that ships having a cargo capacity of not less than 7,000 tons and a sea speed of not less than 14 knots at half load, be built; it is further understood that the loan is to be redeemable in about 15 years, and that it is to be granted up to two-thirds of the cost of construction of each one of such ships. If this plan materializes, the Government is to grant a loan of Y.30,000,000 in three years; as the loan is to be made up to two-thirds of the cost of construction, the annual amount to be spent in ship building under this system will come up to Y.15,000,000 which, converted into tonnage of diesel cargo boats, corresponds to from 80,000 to 90,000 tons. In view of the fact that the annual launching of new ships stood at about 50,000 tons even when the industry was most severely depressed after the War, the addition of foregoing 80,000 to 90,000 tons should keep shipyards fairly busy. The one outstanding

difficulty that is found in the way of realization of this plan is that the Government, though it will guarantee the payment of the interest, will not compensate the banks the total amount of the loan in case it became a total loss. Without this guarantee of the total compensation, however, there are few banks that would make the loans because they are exceedingly precautious as regards the financial accommodations to shipping and shipbuilding concerns; they have had bitter experiences in the past. With this view, it is feared that the companies which can avail themselves of this proposed system will be limited only to those which can raise funds elsewhere even without the aid of this system.

As regards the proposal of a gigantic amalgamation of the tramp ship owners, no tangible step has so far been taken. But the plan is that the tramp ship owners hand over their ships to their respective creditors; the creditors organize a joint committee of valuation and have the committee value the ships that came into their possession; with the investment of these ships which are newly valued, the creditors organize a new shipping company and have this company operate the ships. If realized, this plan will improve the shipping market in Japan immediately as the new company will regulate the supply of space, and it will also scrap old ships which do not pay. Furthermore, the cost of ships registered in the book will be considerably low as the joint committee of valuation will see to it, and the earning of each ship will be increased subsequently in due proportion to the redemption of the cost. The trouble is that this plan has a remote chance of being materialized due mainly to the difference of interest of each creditor concerned.

While the plans of improving the shipping market and the shipbuilding industry are thus considered and advocated, the actual state of affairs is steadily developing from bad to worse. The number and tonnage of ships that were forced to be tied up are fast increasing. To tide over the growing difficulty, the shipbuilding companies are hunting jobs in the field of civil engineering, while others contemplate to start automobile manufacturing. In their frantic efforts to get work, if simply in order to keep thousands of employees furnished with something to do and thus avoid the public criticism of increasing unemployment to an already heavy total, some shipyards now contemplate to undertake even the work of scrapping old ships. The Yokohama Dockyard Company, among others, was reported sometime ago to have opened negotiations with N.Y.K. Upon the recent completion of a large fleet of superb passenger liners, the N.Y.K. has tied up a number of old ships which are to be scrapped eventually; the Yokohama Dockyard, subsequently, proposes to do the scrapping, which the company, nor any other companies now contemplating to do similar work, had never dreamed of undertaking when business was better.

Taking all in all, the prospects of Japan's shipbuilding industry may be described as anything but bright at present. Unless some of the pending plans materialize, or some new factors develop, the situation is bound to be further aggravated. The business management will become further difficult, especially those which specialize in the construction of new ships. A drastic readjustment and curtailment of the equipment is unavoidable. It is a question of time that some of them will be amalgamated one with the other or some factories are closed altogether. Meanwhile their side line of business, such as manufacture of civil engineering materials, construction of rolling stock, automobiles etc., may assume more importance than their main business—the shipbuilding.

Mechanical Stokers in Modern Steam Power Plants

(Continued from page 568).

on their original order of 1917 and two repeat orders, aggregating 130 retorts, representing 2,330 sq. feet grate area were installed in their Fukusaki Power Station, Osaka. Another important installation of Riley stokers, is found at the Amagasaki Steam Power Station of the Nippon Electric Power Company in Osaka, consisting of four-thirteen retort Riley Super-stokers, representing 1,525 sq. feet total projected grate area. All the above boilers are served by B. F. Sturtevant Co's forced draft and induced draft fans.

The Riley stoker has not only all the desirable features of other underfeed stokers, but in addition, it has reciprocating retort sides, which is a distinct feature not found in any other underfeed stokers. The reciprocating retort sides prevent clinker formation by continuously breaking up the fuel bed through their slicing

action. The constant sheering action of the moving grates and rocker plates keep the fuel bed open and uniformly porous, giving proper air distribution over the entire fuel bed, controlling the excess air to the practical minimum. In addition to the above advantages, the moving grates enable Riley stoker to start up quickly from banking condition to meet instantly heavy overloads. This instantaneous response to high fluctuating loads makes this type of stoker particularly adaptable for stand-by plants, which operate in conjunction with hydro-electric stations.

The travel speed of the reciprocating retort sides is easily adjustable, which in conjunction with other desirable features makes this stoker adaptable to practically all kinds of coals, regardless of ash content. Even when handling high ash coals, the ash pit loss can be reduced by this stoker to an exceedingly small value. This adaptability of the Riley stoker to a variety of coals is a decided asset, especially where coal of uniform quality can not be obtained, except at a higher price. The Riley stoker can burn poorer and variable quality coals at advantage, where such coals can be obtained at lower prices, thus enabling power stations to produce kilowatt-hours at lower fuel cost.

Japan's Special Bank for Industrial Financing

(Continued from page 575).

are the Chunichi Jitsugyo Kabushiki Kaisha (Sino-Japanese Commercial Co.) and the Nikka Boshoku Kabushiki Kaisha (Sino-Japanese Spinning Co.).

Activities of the Development Companies in China Unprofitable

According to reports, the financial activities in China handled through the three development companies have resulted in heavy losses. The business reports of the firms in question show losses from non-payment of interest or principal, and also from unprofitable investments.

Undoubtedly, the unfavorable economic conditions existing in both China and Japan during the last few years, aggravated by military disturbances on the one hand and by financial depression on the other, have most seriously handicapped their operations. In some instances investments may have been made in unsound enterprises and on insufficient security. However, considering the range of industries which the Toa Kogyo Kabushiki Kaisha and Chunichi Jitsugyo Kabushiki Kaisha have sought to promote, the losses suffered probably have not been much greater than the financial risks assumed.

The principal industries in which these firms have extended their activities are telephone communications, railway construction, mining (especially iron ore), salt production, and textile manufacturing. Transactions in real estate also have been made an important phase of the business of the Toa Kogyo Kabushiki Kaisha.

Use of Oxy-Acetylene Blowpipe in Shipyards

(Continued from page 577).

In addition to rivet "burning," there is always a great deal of other cutting to be done. Odd shaped plates are cut to size, holes of all sizes, and for various purposes, deck plates, beams, bars, rods and frames. In fact, even where no ships plates are being removed the cutting torch is nearly always in requisition on ship repair jobs.

The Oxy-Acetylene torch finds much employment for heating on ship work. It often occurs that when plates have been removed it is found that part of the ships frames are bent or buckled. To remove and replace same would be very costly but the oxy-acetylene torch often makes it possible, by heating, to reshape and recondition such bent members. Also plates that have been bent, are often brought back to proper shape by use of the heating properties of the oxy-acetylene flame. For those purposes special large size welding or heating torches are used, thus placing at the disposal of the operator a large, very hot flame, which, however is completely under his control and can be applied just where the heat is required.

Naturally a great variety of repair jobs come to the shops of shipyards. Almost every kind of equipment, machinery, containers, steel furniture, etc. are used on vessels, much of which needs repairing from time to time. And for such work the welding torch is often much in demand.

(Continued on page 586).



Aerial View of the Hikoshima Shipyard and Engine Works

Development of Fishing Boat Construction in Japan

The Hikoshima Shipyard and Engine Works of the Mitsubishi Shipbuilding and Engineering Co., Ltd.

THE Hikoshima Shipyard and Engine Works of the Mitsubishi Shipbuilding & Engineering Company is situated on an island of that name lying between the ports of Moji and Shimonoseki, and covers an area of 13 acres facing the islet named Ganryushima, which forms a natural breakwater. The Company also owns extensive Shipyards, Engine Works and Docks at Nagasaki and Kobe, but whilst these establishments are devoted mainly to construction of large tonnage, the Hikoshima plant was laid down with the special object of catering for the requirements of the fishery industry centered around Shimonoseki and the repairing of vessels.

For this reason, the principal activity carried on at this Works is the construction of fishing vessels, patrol boats, and the repairing of small and medium sized craft up to 6,000 tons gross. Up to the present, more than one hundred such vessels have been built and put into service since the plant commenced operations in December 1914. In one year, from November 1, 1928 to October 31, 1929, as many as 442 vessels of a gross tonnage of 543,364, were repaired at this establishment.

A notable tendency in recent years has been the demand for very large fishing boats, and because of the long experience and special facilities possessed by this Shipyard, the plant has been fully engaged on such work for a long time.

The Hikoshima Works of the Mitsubishi Shipbuilding & Engineering Company, Limited, is fully equipped with all the latest and most up-to-date machinery and appliances. It comprises Machine, Blacksmith's, Boiler-Maker's, Fitters', Carpenters' and Foundry Shops, cranes of various capacities and all other apparatus and appliances necessary for the expeditious and efficient construction and repair of vessels.

There are three graving docks of concrete at Hikoshima, of the following capacities:—

		Length	Breadth	Depth
No. 1 Dock	...	360-ft. 0-in.	56-ft. 0-in.	18-ft. 0-in.
No. 2	..	450-ft. 0-in.	70-ft. 0-in.	18-ft. 0-in.
No. 3	..	255-ft. 6-in.	29-ft. 0-in.	15-ft. 0-in.

The Hikoshima Plant, while functioning as a separate unit under the control of the Head Office of the Company, which is, conforming to the usual Mitsubishi practice, located in Tokyo, works in the closest conjunction with the sister Shipyards and Engine Works in Nagasaki and Kobe.

Use of Oxy-Acetylene Blowpipe in Shipyards

(Continued from page 585).

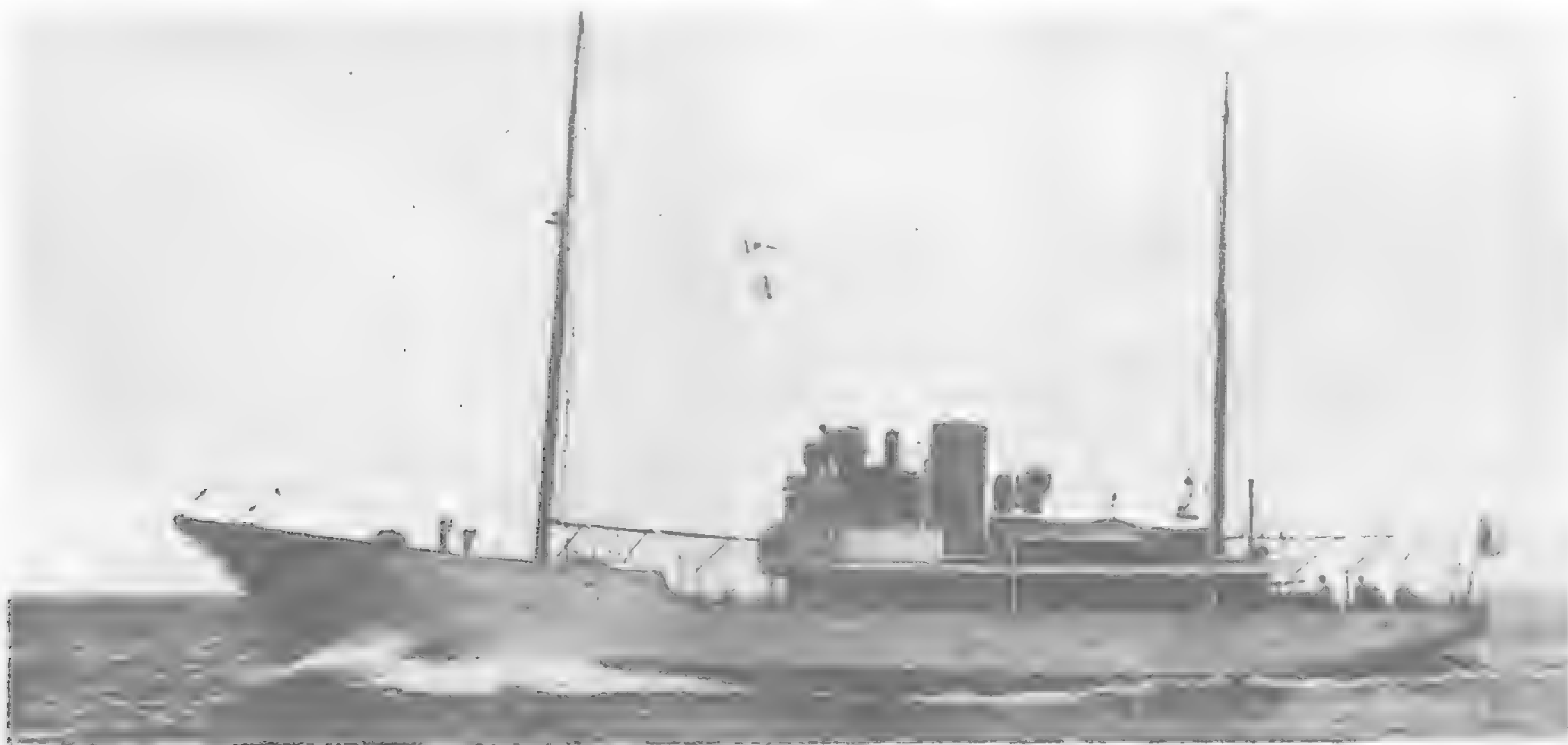
The Oxy-Acetylene welding and cutting torches are also used extensively in shipyards for making all sorts of equipment for their own use. Stoves, smoke pipes and stacks, ventilators, iron frames for various purposes, racks and stands and containers of a large variety, are some of these items. Recently we saw some steel containers being made for pressure oil burners. These were made of $\frac{5}{8}$ -in. steel, 12-in. inside by 24-in. high. They were rolled, welded longitudinally and the bottom and head brazed in the manner illustrated. These containers had to stand 100 lbs. air pressure.

So important has become the oxy-acetylene torch in shipyards, that to-day they would doubtless find it difficult to carry on without same.

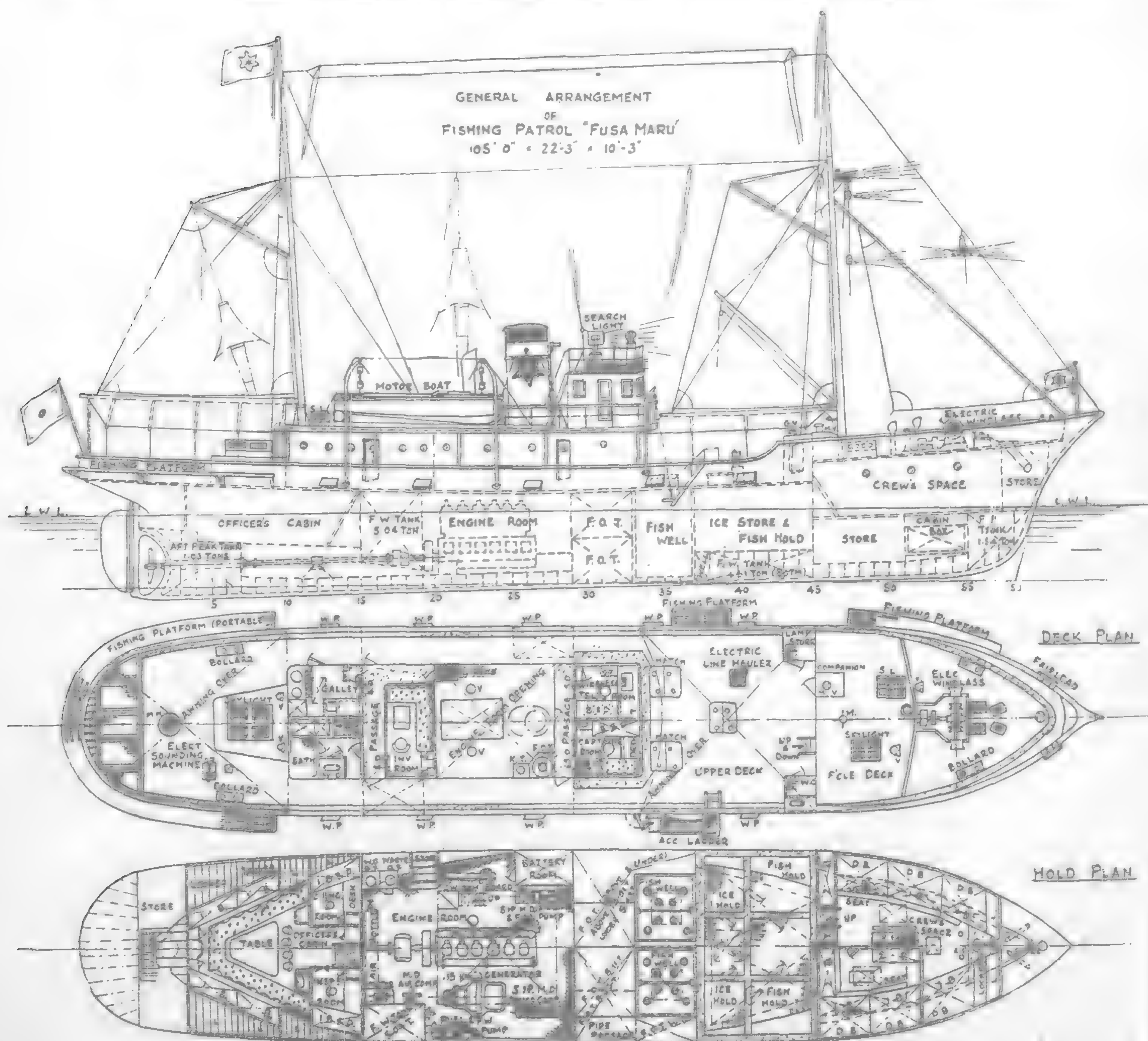
The Far East Oxygen & Acetylene Co., Ltd., (S.O.A.E.O.) operating in the Far East since 1914 has been the pioneer in this part of the world in autogenous welding and has successfully carried out many important repair works to large steamships.

JAPANESE FISHING FLEET LEADER SHIP "FUSA MARU"

Built for the Chiba Prefectural Government at the Hikoshima Works for the Mitsubishi Shipbuilding and Engineering Co., Ltd.



Japanese Fishing Fleet "Leader" Ship "Fusa Maru," Driven by Ikegai Oil Engine



Three Special Kinds of Fishing Boats Recently Developed in Japan

By SEIICHI KATO, Chief Ship Inspector of Itozaki Marine Office

Introduction

JAPAN is poorly favored with natural resources ; but the author thinks there is one matter in which the country is rich, i.e., aquatic production. Actually, Japan has the largest output of aquatic products in the world, which is said to aggregate above 2,000,000 tons. Great Britain and Ireland are next, their total being about 1,100,000 tons. But Japan has about 1,130,000 people who make a living by fishing and 350,000 fishing boats, whereas Great Britain is said to have only 90,000 fishermen and 20,000 fishing craft. In comparing the production per head or per boat of both countries, we find Japan's is only one-tenth. Therefore, Japan needs, evidently, further improvement in the methods used. When we look upon the condition of Japan of ten or twenty years ago, we realize her rapid development in the right direction. In the following table, it is shown that the catches have increased by 30 per cent. and the number of larger fishing boats and motor boats have also increased considerably, while the total number of fishing boats has decreased.

NUMBER OF FISHING BOATS.

Years	20 tons and above		20 Below tons		Catches in tons
	Steamers & Motors boats	Sailing boats	Motor boats	Sailing boats	
1914	222	310	2,300	387,000	1,600,000
1926	979	107	14,924	334,924	2,297,800

NUMBER OF LARGER FISHING MOTOR BOATS AND STEAMERS IN 1926, CLASSIFIED BY KINDS OF FISHING.

<i>Material of Hull</i>		<i>Trawlers</i>	<i>Whalers</i>	<i>Bonito fishing boats</i>	<i>Floating canneries for crab fishing</i>	<i>Fish carriers</i>	<i>Seiners, liners, drifters, etc.</i>
Steel	.. ..	70	30	20	14	53	38
Wood	.. ..	—	—	179	—	73	502

The improvement of fishing boats has thus been remarkable during the last twenty years. This has been achieved not only by shipbuilders, but also by the aid of fishermen of progressive and enterprising spirit, and by the Government officers administering the Deep Sea Fisheries Encouragement Act.

Among other things, the three types of fishing boats mentioned here have been most noticeable and creative.

Bonito Fishing Boats

The bonito is a fish of fifteen to thirty inches in length, moving in shoals in warm currents. They are chiefly caught by the rod, though drift nets or purse seines are sometimes used. The boat should have sufficient stability and should be steady in a seaway, for a great number of men stand side by side on the sponson built outside of the bulwark at one side of the boat when fishing. The boat should have fish wells for live sardines, which should necessarily be used as bait though imitated bait might be used with it in the middle of fishing.

The boat should have good speed and quick maneuvering quality, in order to find and chase the best shoals and return to port quickly in order to sell the catches at the best price. Before the year 1905, the fishing boat was a Japanese junk and the fishing was carried on from April to September at every part of the south and east coasts of Japan. Even in this period, the fishing craft belonging to Shizuoka Prefecture went as far as the Izu Isles, several days being spent in one voyage. These were the bigger junks, the principal dimensions for instance being 50-ft. 0-in. by 11-ft. 0-in. by 4-ft. 6-in., the crews numbering some thirty hands. When there was little or no wind, the men took to the oars. In 1906, the Fishery Experimental Bureau of Shizuoka Prefecture built a new boat on the European model, named *Fuji Maru*, under subsidy from the Government. She was a ketch-rigged, welled smack of 25 tons gross, with a 20 b.h.p. four cycle electric ignitioned petroleum motor made by the Union Iron Works of San Francisco as the auxiliary power. This was the pioneer motor fishing craft in Japan. Some fishermen thought such a boat might roll heavily, and not be

suitable for fishing operations, or that the sound of the motor and the odor of kerosene might drive the fish away. But her performance was quite satisfactory. As the Government granted a subsidy to motor fishing boats strongly built after this model, many fishermen installed motors or built new boats. Thus a special Eurasian type of craft appeared, having a broad keel to allow of hauling up easily on beaches, an angular knuckle on the bilge to check rolling, and masts capable of removal for the same purpose, as is done in Japanese junks ; but she was stronger built with more frames than junks and had a complete deck, fixed rudder, clipper stem, counter and screw aperture. She could run above seven knots with the motor only and did not spread her sails except in case of a fair wind. Several petroleum motors for fishing boats were imported from abroad and some were built in Japan. The imported motors were "Union Dan" "Mitz and Weis," "Griffin," "Bolinder," "Scandia," etc.

A few petrol motors and suction gas engines were also adopted. But by and by, home-made two cycle hot bulb petroleum motors of improved "Bolinder" pattern became most popular because of their small fuel consumption, simple handling and smooth running. A few years afterwards, high compression motors using heavy oil as "Fairbanks Morse" and improved "Bolinder" not using injection water were imported. In the meantime, several home makers improved their motors also in this direction.

Recently, for larger power, home made four cycle air injection Diesels have been generally adopted for the sake of fuel economy. On the other hand, sizes of boats became larger step by step, to 20 tons, 40 tons, 60 tons, 80 tons, even to 180 tons. Since 1922, some steel boats have been built. At present, the fishing ground extend to the Bonin Isles, Marcus Island and Formosa. The total amount of catches in Japan proper is now valued at Y.35,000,000, while it amounted to only Y.5,000,000 twenty years ago. The bonito is not only cooked when fresh, by boiling, smoking and drying, when it is suitable for storage, but it is universally used as a condiment known as katsuobushi. There is no limit to the demand for katsuobushi, because it is essential as seasoning for soup and other domestic uses. Therefore this branch of fishery has great prospects of continued development.

GENERAL ARRANGEMENT OF A BONITO FISHING BOAT

SCALE 1/4 INCH TO 1 FOOT

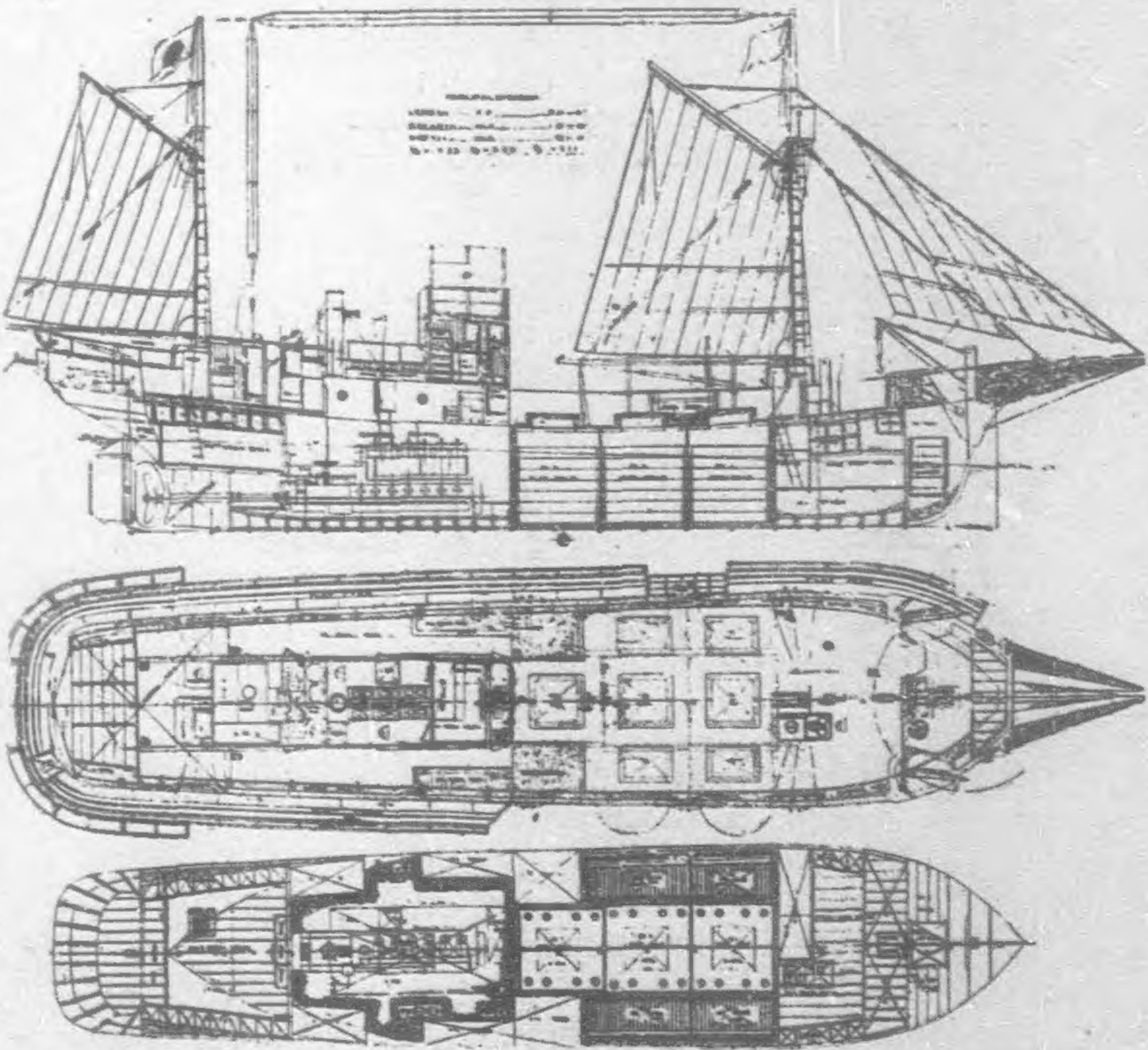


Plate 1

MIDSHIP SECTION OF A BONITO FISHING BOAT

SCALE 1 INCH TO 1 FOOT

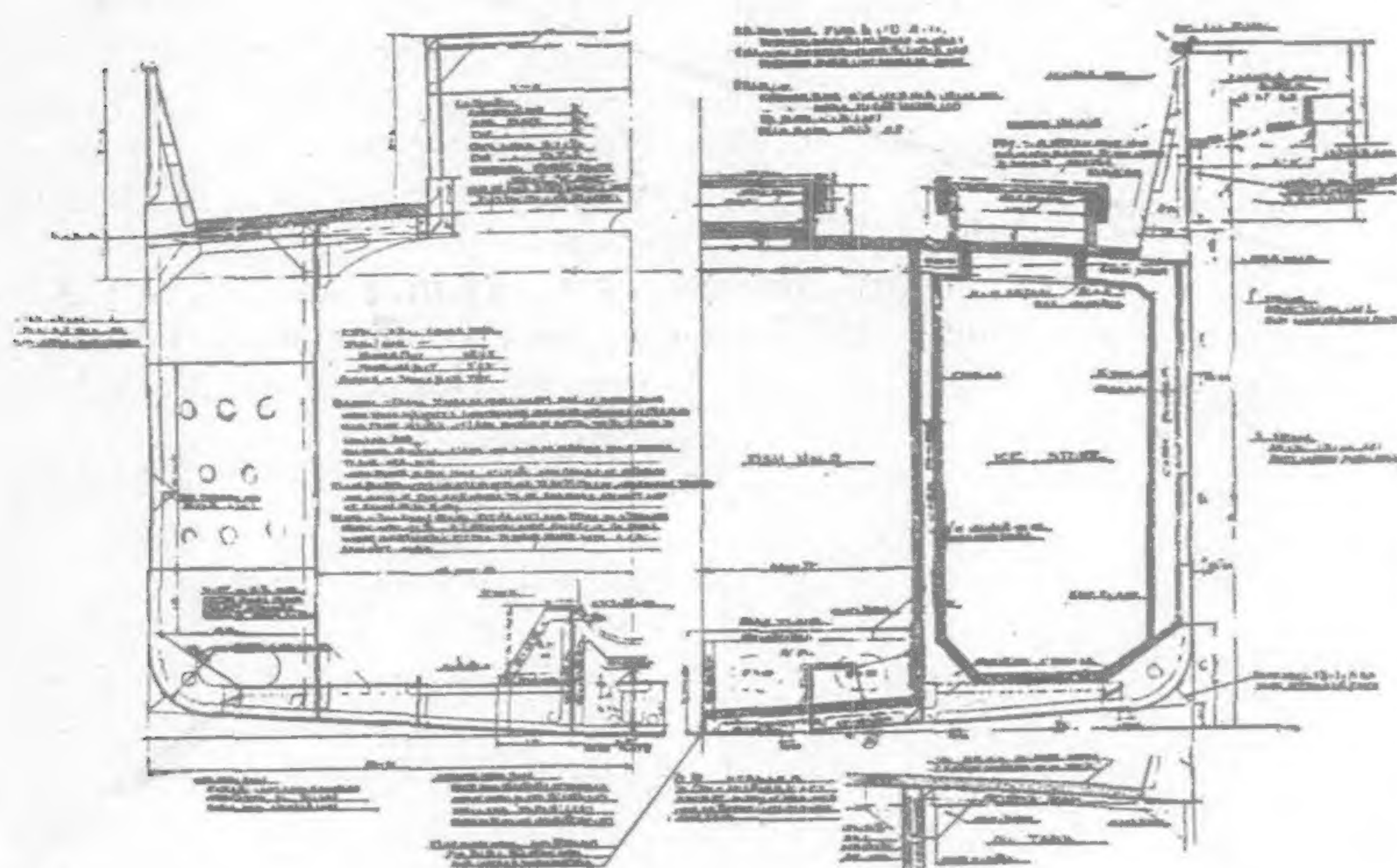


Plate 2

Plates 1 and 2 are the general arrangement plan and midship section of the latest bonito fishing boat. Her dimensions are as follows:—

Principal dimensions : 80-ft. 0-in. by 79-ft. 0-in. by 9-ft. 0-in.
 Tonnage : Gross, 102.02 tons ; Net, 35.84 tons ;
 Raised quarter deck : Height, 9-in., Length 34-ft. 4 $\frac{1}{2}$ -in. ;
 Height of bulwark : 4-ft. 2-in. ;

Sheers of the boat floating at even keel : Forward, 3-ft. 3 $\frac{3}{4}$ -in.,
 Aft, 3-ft. 5 $\frac{1}{2}$ -in. ;

Draft, displacement, etc. at loaded condition : Draft, 7-ft. $\frac{1}{2}$ -in. ;
 Displacement, 195.6 tons ; Block coefficient, 0.636 ;
 Prismatic coefficient, 0.669 ; Gm, 2.07-ft.

Main engine : "Niigata Diesel," B.H.P., 200 at 350 revolutions.

Propeller : Diameter, 56-in. ; Pitch, 38-in. ; No. of blades, 3.

Auxiliary machinery : (1) Auxiliary compressor, coupled to the motor for wireless use. (2) General service pump driven by a belt connected to the main engine, the capacity being 250 gallons/min. This is used not only for wash deck, bilge suction, fire main, etc., but also for spraying water from some nine hoses connected to the 2-in. main fitted along the outside of bulwark, which is useful during fishing operation, and for discharging water from fish wells. (3) Motor for wireless telegraph. (4) Dynamo for lighting, driven by a belt from main engine.

Trial result : Draft forward, 2-ft. 2 $\frac{1}{2}$ -in. ; aft, 7-ft. 0-in. ; mean, 4-ft. 7 $\frac{1}{2}$ -in. ; Displacement, 116.2 tons ; Block coefficient, 0.58 ; Prismatic coefficient, 0.63 ; Speed, 10.25 knots ; Revolutions, 379.

Number of crew : About 70.

Tank capacities, etc. : Fuel oil tanks, 14 tons ; Fresh water tanks, 6.5 tons ; Ice stores, 17 tons.

Fish wells : Total capacity of water at loaded condition, 1,164 cubic feet. There are three compartments which are bordered by watertight wooden bulkheads and bottom ceilings. Each compartment has eight brass pipes of 4-in. diameter and 6-in. length on the bottom ceiling to communicate with the sea water, gratings and guide lips being fitted on. In outward voyages, all compartments are used as wells for the baits ; but in homeward voyages, the catches are stored in these compartments with iced salt water, all sea connections being closed by screwing down the plugs on pipes, water being discharged by pump suction and blocks of ice being dropped in.

Ice stores : Both sides of fish wells are used as ice stores. They are insulated with cork dust or cork sheets by top and sides, as shown in midship section plan.

Sponson for fishing platform : Steel bracket plates are fitted outside of side and stern bulwark two feet below the top of rail, and 1 $\frac{1}{2}$ -in. thick wooden planks are laid on, making a sponson platform 2-ft. 6-in. wide for fishing operation.

Seine Fishing Twin Motor Boats

Seine fishing by junks was extensively carried on in several districts of Japan from olden days. In 1909, it was first undertaken in a steamer off Hokkaido. Next year, the Fishing Experimental Bureau of Kyoto and Fukui Prefectures made a joint experiment in seine fishing with a motor boat. In 1913, bonito fishing boats in Fukushima and Ibaraki Prefectures began to be adapted to seine fishing in the leisure season during the winter. On the other hand, many motor boats with winches worked by a belt and gear connected to the main engine were built especially for this fishing in Kyushu and western parts of Honshu. A few years later, some fishermen in the latter districts introduced successfully a method of dragging the seine by two motor boats about 600 yards apart as a set. This method soon prevailed everywhere. The boats used became larger and larger,—20 tons, 30 tons, and so on. The seine process is similar to trawling, though the net used is different. As in the case of trawling this method of fishing was violently opposed by the coastal fishermen and zoologists. In 1921, the Government proclaimed areas off the coasts of Japan to be prohibited for this kind of fishing and issued regulations, by which these boats should obtain the sanction of the local Governments, who restricted the gross tonnage of boats to 50 tons. This drove fishermen to the trawling grounds of the China Sea with boats having a maximum tonnage of 50 tons.

At present, there are about 200 pairs of seine motor boats in the trawl areas, while the number of trawlers is restricted to seventy by the Japanese Government. This prohibition was a serious blow to trawlers, because seine fishing boats use similar size of nets and get the same catches or even better earnings than trawlers, the kinds of fishes caught fetching higher prices, notwithstanding the smaller size of their boats and accordingly smaller expenses. Here it might be observed that the trawlers improved their nets by adopting the "Vigneron Dahl" patent which partly resembles the Japanese seine, and they increased their sizes and went further out to sea into other fishing grounds. Some of them have adopted Diesel engines for propelling, and installed refrigerating plants for the longer voyages. On the other hand, seine fishers demand boats larger than 50 tons. The Formosa Government approves the size of boats up to 100 tons which may be the most suitable size ; but boats too big are not suitable for this fishing from the point of maneuvering and economy. At present, the seine fishing boat can not work so hard as the trawlers in winter on account of the weather, and generally do not work at night. Thus, the trawlers and the seine boats seem to be complementary each having its own merits and working capacity. The total fleet of seine fishing boats working in the China Sea is valued at about Y.15,000,000. Seine fishing twin motor boats should be strongly built, seaworthy and speedy, for the work in rough seas through the whole year in spite of the small tonnage and have to return quickly to port.

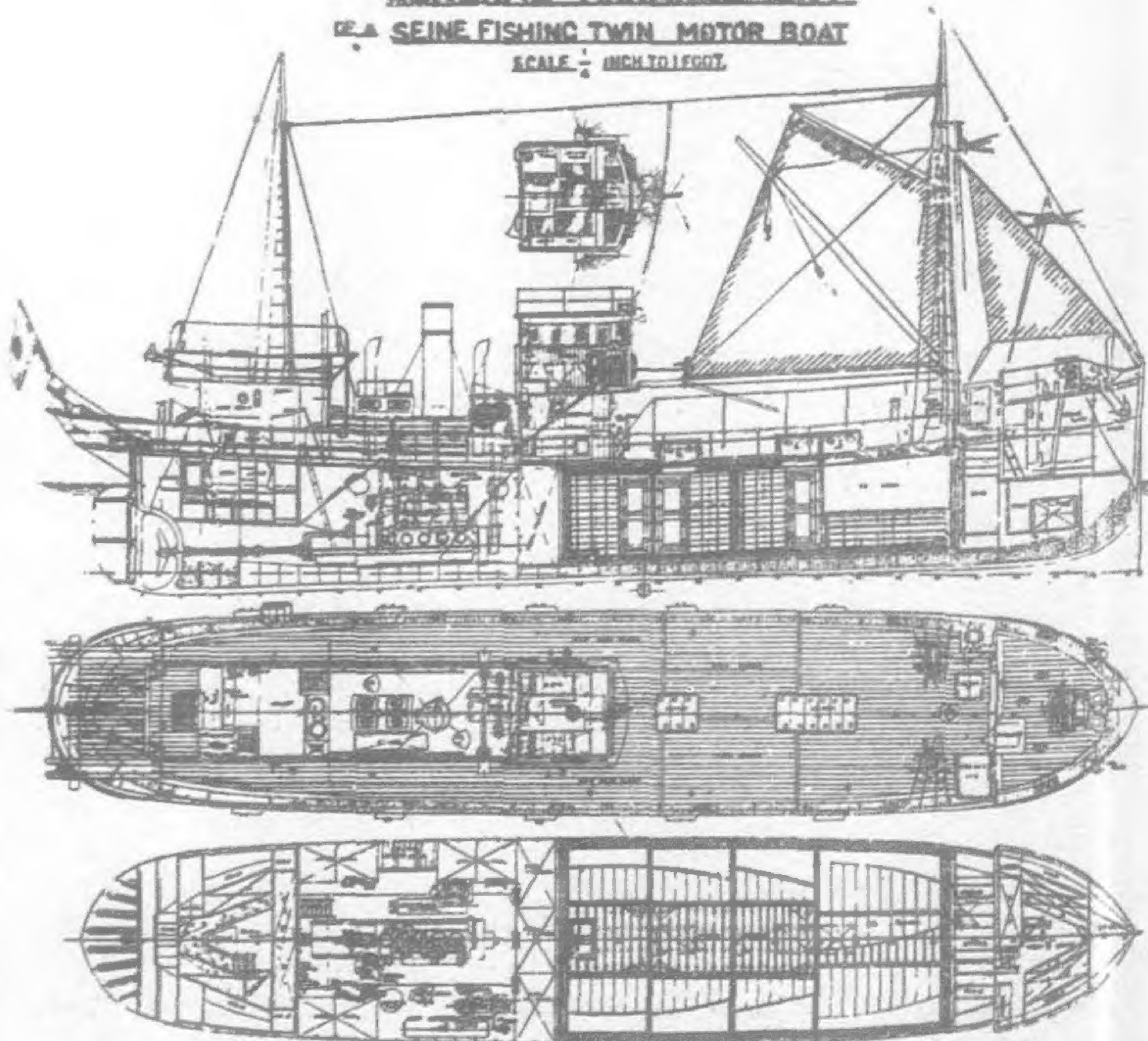
GENERAL ARRANGEMENT
OF A SEINE FISHING TWIN MOTOR BOAT
SCALE $\frac{1}{2}$ INCH TO 1 FOOT

Plate 3

MIDSHIP SECTION

SEINE FISHING TWIN MOTOR BOAT

SCALE 1/16" = 1'-0"

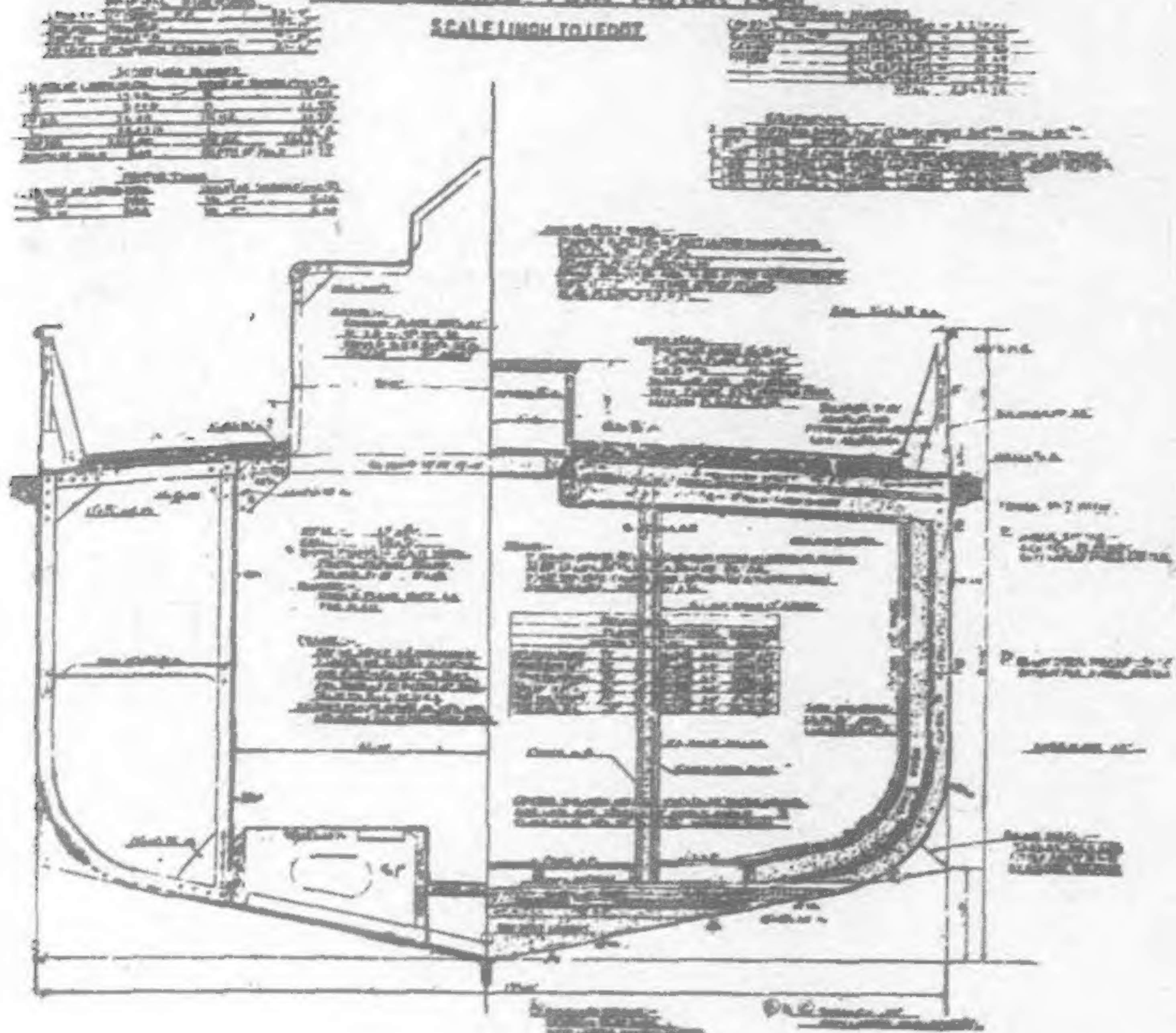


Plate 4

Plates 3 and 4 are the plans of the most up-to-date vessel belonging to a fishing company in Formosa. Particulars are as follows:—

Principal dimensions : 85-ft. 0-in. by 17-ft. 0-in. by 9-ft. 0-in.

Tonnage : Gross, 87.2 tons ; Under deck, 78.0 tons ; Net, 31.6 tons.

Sunken forecastle : Height, 2-ft. 9-in. ; Height of bulwark 2-ft. 9-in.

Propeller : Manganese bronze, three bladed right handed screw propeller ; Diameter, 4-ft. 4-in. ; Pitch, 3-ft. 1-in. ; Developed area, 750 sq. in.

Auxiliary machinery : (1) Emergency air compressor, driven by 2 h.p. "Tobata oil motor ;" (2) 2-in. centrifugal pump for general service ; (3) "York ammonia compressor ;" (4) 1½-in. "Inokuti centrifugal pump" for the cooling water of the ammonia condenser.

Trial results : Draft forward, 3-ft. 11-in. ; aft, 8-ft. 4-in. ; Displacement, 115.5 tons ; Block coefficient, 0.49 ; Prismatic coefficient, 0.591 ; Speed, 9.45 knots ; Revolution, 355.

Number of crew : 10.

Tank capacities : Fuel oil tanks, 675.22 cub. ft. ; Fresh water tanks, 7.8 tons.

Fish hold : Total volume, 2,710 cub. ft. Fish hold is divided into six rooms and can store 1,100 boxes in total, kept at 30° fahr. by the aid of refrigerating plant. Each box contains crashed ice and 50 lbs. of fishes. The total length of ammonia cooling pipe is 731-ft. 0-in., the diameter being 1½-in.

Fish hold insulation ; Sides :—Cork dust between frames, two ¾-in. boards inserted with insulating paper between them, 4-in. cork dust, two ¾-in. boards with insulating paper. Top :—3-in. cork sheet between beams, two ¾-in. boards with insulating paper, two 2-in. cork sheets, two ¾-in. boards with insulating paper.

Bottom :—Cork cement between floors, 1½-in. wooden ceiling, two 1½-in. cork sheets, 1-in. asphalt.

Refrigerating plant ; 4½ refrigerating tons "York" machinery of direct expansion system. The size of ammonia compressor is 4-in. by 4-ft. 4-in. It is driven by a belt connected by main engine, with a special apparatus to keep the revolution automatically constant.

Motor winch : The motor winch is driven by a belt connected to main engine. The power about 30 h.p. and the designed number of revolutions of the warp heads is 90/min.

A FLOATING CANNERY FOR CRAB FISHING.

394'50" x 49'11" x 25'36"

SCALE 1/16" = 1'-0"

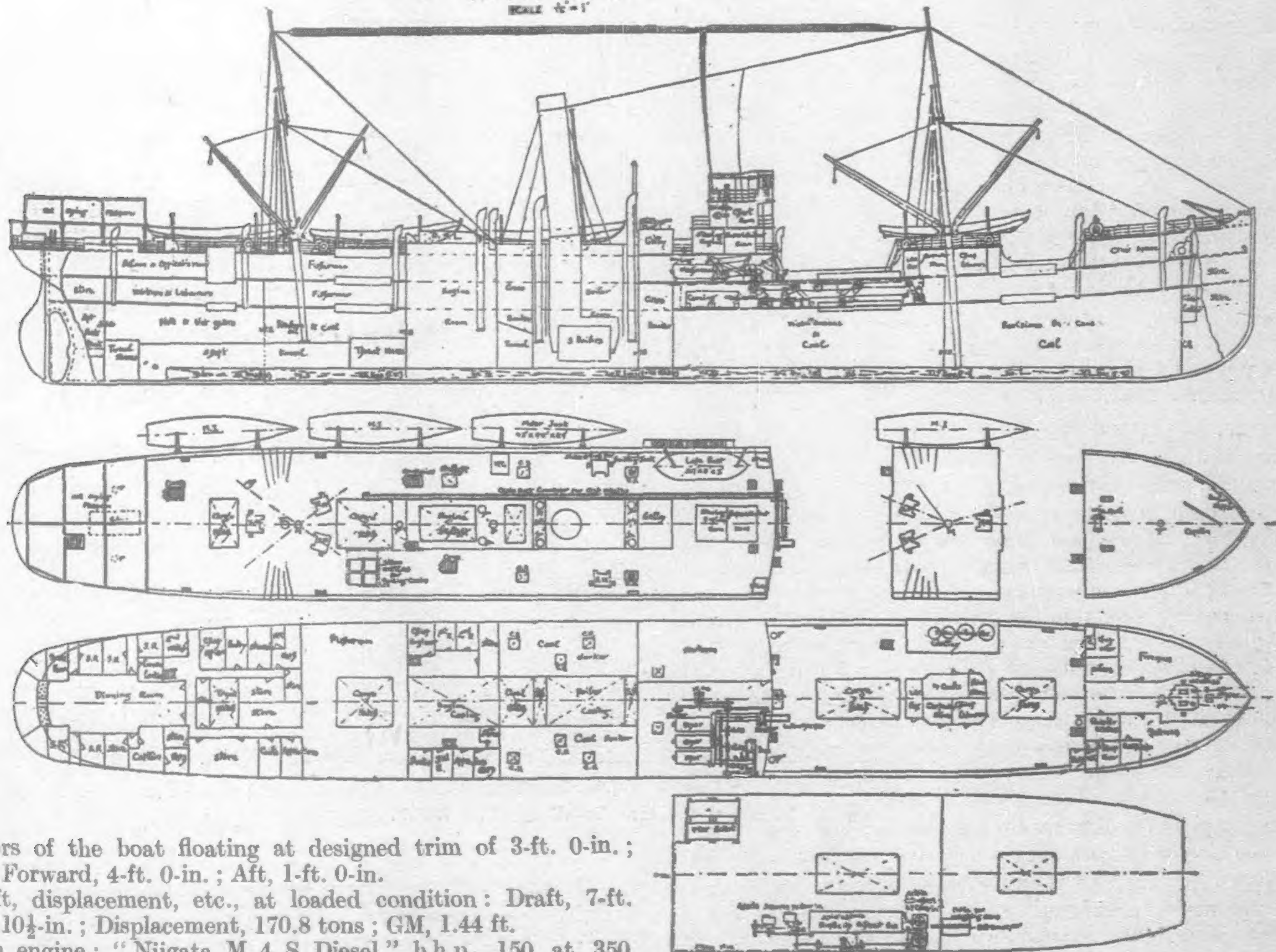


Plate 5

Sheers of the boat floating at designed trim of 3-ft. 0-in. ;

Forward, 4-ft. 0-in. ; Aft, 1-ft. 0-in.

Draft, displacement, etc., at loaded condition : Draft, 7-ft. 10½-in. ; Displacement, 170.8 tons ; GM, 1.44 ft.

Main engine : "Niigata M 4 S Diesel" b.h.p., 150 at 350 revolutions.

Special fittings: (1) Acetylen lighting apparatus. (2) Two cast iron rollers for hauling tow rope, fitted on wooden frames strongly built on the stern bulwark. (3) Two wire reels fitted on the deck near foremast, capable of winding 1,800-ft. of $\frac{5}{8}$ -in. dia. tow wire rope. (4) Two bow rollers for anchoring warp, sometimes in rough weather being used for hauling tow rope. (5) 2-in. dia. steel horse fitted on the stern bulwark to hook the end of tow rope. (6) Fish ponds at the sides of hatchway on deck, built of cast iron stanchions and shiftable boards. (7) Net dyeing tank of one ton volume fitted on the starboard deck aft of sunken forecastle.

Floating Canneries for Crab Fishing

The crab canning export industry has been carried on since 1907 or so on the coasts of Hokkaido, Chishima and Saghalin. To prevent the extinction of crabs, the Government issued regulations to prohibit this fishing within certain distance from the coasts of these districts. On that occasion, cod fishing smacks working in the Okhotsk Sea reported the abundance of crabs on the west coast of Kamchatka.

In 1920, the Fishery Experimental Bureau of Toyama Prefecture sent a schooner of 175 tons to the Okhotsk, equipped as a crab fishing boat and floating cannery; and it was a great success. Many people then endeavored to transform larger cargo steamers for use in this profitable business. The Government issued regulations requiring official sanction for this type of fishery in order to restrict the number of boats and check production. At that time, there were seventeen steamers of 700 to 4,000 tons engaged in this business and the total product was valued at Y.20,000,000. In spite of the restriction policy, a depression in price has appeared, bringing financial difficulties in its train. Consequently, amalgamations having been accomplished the year before last, there are now two large firms, one having nine boats and the other five. The floating canneries are equipped at Hakodate in the middle of April to sail for the fishing grounds, where they stay till the middle of August.

To explain further, let us take a steamer of 3,000 tons for example. Her holds are loaded with about 2,000 tons coal, 20,000 empty cans, and about 800 tons of fresh water. Besides crew, some 450 fishermen and other workmen are quartered in the aft 'tween deck. On both sides, eight motor junks are carried in davits.

These are about 40 ft. in length, 10-ft. in breadth, and fitted with 10 h.p. petroleum motors. They are chiefly used for hauling nets and transporting catches to the mother ship. Besides these motor junks, the floating cannery is accompanied by one or two self navigable larger motor boats of 30 to 80 tons. They are used for casting nets and for communication between the junks and the mother ship. They cast nets within a circle of about five miles radius with the mother ship as the center. In proper intervals of time, the mother ship changes her anchorage. The catches together with their nets are hauled up on the after upper deck of the mother ship by the derricks of the after mast from the junks coming alongside. The crabs are taken off from the nets and boiled in the steam kettles on deck. By means of derrick booms and tackles, net bags containing boiled crabs are once dipped into the sea outboards from the after deck, and hauled up to the forward upper deck. On the fore upper deck, crabs are cut in pieces and classified. They are carried down in baskets to the fore 'tween deck where they are canned, weighed, sealed and steamed by several machines. The finished cans are boxed and stored in the holds. A floating cannery of this size can produce about 350 boxes per day, each containing eight dozens of half-pound cans.

Plate 5 is the elevation and deck arrangement plans of a floating cannery of 4,000 tons. This steamer was equipped with crashing, pressing and drying machinery this year, to get fish oil and fish meal from crab waste

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